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BOTANICAL SURVEY OF SOUTH AFRICA
MEMOIR No. 19.

THE VALUE OF BOTANICAL SURVEY

— AND —

THE MAPPING OF VEGETATION AS APPLIED TO FARMING SYSTEMS IN SOUTH AFRICA

by

J. A. PENTZ

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Department of Agriculture and Forestry

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FOREWORD.

This paper prepared by Mr. J. A. Pentz of this Division, entitled "The Value of Botanical Survey and Mapping of Vegetation as applied to Farming Systems in South Africa", is the outcome of Mr. Pentz's work in Natal, where he has been engaged for the past two years on a survey of the catchment area of the Tugela and Bushmans Rivers in connexion with our watershed and reclamation research. Mr. Pentz has found and has shown clearly that where a particular type of farming is carried on which does not take cognizance of the natural features of the country and the natural vegetation, and is not naturally adapted thereto, there disaster to both land, man and beast is bound to follow. There is no doubt that Mr. Pentz has struck at the root of much of our farming troubles in this country, and his paper only serves to emphasize once again the need not only for a more extensive but also for a more intensive vegetation survey of the country combined with farming practice.

I. B. POLE EVANS.
Chief, Division of Plant Industry.

The Value of Botanical Survey and the Mapping of Vegetation as applied to Farming Systems in South Africa

By J. A. Pentz, Botanical Survey Officer, Estcourt Research Station.

INTRODUCTION.

Since the world depression, almost every country has realized the necessity for placing agriculture on a sound basis. Publications from every part of the world by authorities on agriculture and by workers under the auspices of the various Governments, show that the gravity of the situtation is realized and that attempts are being made to solve the problems with which each country is faced. The " Use and Misuse of Land "(1), " The Land, To-day and To-morrow "(2), " Proceedings of the National Conference on Land Utilisation "(3), and " A Survey of the Pastures of Australia "(4), to mention a few, show that much attention is being paid to the subject.

In South Africa, Pole Evans (5) has writen papers on " The Veld and Its Resources " and " A Vegetation Map of South Africa ". Professor Leppan (6) has raised the question of a sound agricultural policy. He and various other writers have stressed the fact that South Africa is primarily a pastoral and not an agricultural country, and attempts have been made to focus the attention of the public on the point. Much thought, time and money, have been spent during the last twenty years in attempts to aid the farming community and to put South African farming on a sound basis. Numerous commissions have been appointed to investigate the problems of droughts, soil erosion, and marketing. Research on every branch of farming has been carried out, and yet the position is but little improved.

Botanical survey in South Africa has been carried out for a number of years, and a great deal of information on the vegetation of the country has been obtained. The time has now arrived to apply the facts revealed in this survey to farming practice, and with this object in view to carry out further surveys of a more detailed nature on the various vegetation types.

The writer here proposes to deal first with various problems facing agriculture in this country and to discuss how botanical survey can be of the utmost use in solving these problems.

Problems facing South African Agriculture.

There are numerous problems facing the country, all of which are very much interlinked. Droughts are blamed to a very large extent for our soil erosion, our over stocking, the uneven and low quality of production, the high cost of poduction, the variability of our markets, and the general denudation of the country.

If it could be said that our rainfall is decreasing and that our droughts with their attendant evils are caused thereby, it would be impossible for man to tackle these problems. If, on the other hand, our droughts are caused by the fact that our soils and mountain slopes no longer conserve moisture as they did, but permit the water to run off to the sea, carrying our best soils with it owing to misuse of land and destruction of vegetation, it is still within the power of man to remedy the evil. Steps must be taken, however, before it is too late. The writer is of the opinion that the misuse of land and the destruction of vegetation leading to excessive run-off, are the prime causes of our long dry spells which, in turn, cause over-stocking and denudation.

We now come to the various causes leading up to the misuse of land and the denudation of the veld. From observation throughout the country it would appear that the question whether the type of farming or farming system is a success or a failure depends almost wholly on whether it is suited or not to the particular type of vegetation. In a particular area with the same vegetation type, many and diverse types of farming are practised. Some are successful, some appear to be successful for a number of years, and some are failures. If the matter is pursued further, we find that the successful farmers, apart from being good farmers, are those whose farming is adapted to the particular vegetation type. Those who appear successful for a time and then meet with difficulties, are those who have exploited their farms in order to meet a particular market, but whose vegetation and soils could not stand up to the treatment meted out to them. The failures, apart from those who call themselves farmers but are not, almost invariably are those whose vegetation and soils were entirely unsuited to the type of farming practised.

One of the biggest factors leading up to the wrong farming system being practised in a particular area, is the creation of a demand for certain products as a result of either world conditions or specialized local markets. It is often thought that as long as there is a market for farm products, the stability of farming is assured. This is far from being the case, as is shown below.

(*a*) *Markets due to World Demand.*

Owing to world conditions during and since the Great War, there have been various booms in the production of different commodities, chief of which were cotton, maize and wool. With each boom, farmers have done their utmost to meet these marktes, irrespective of whether their farms fell within areas really suited to the production of the required commodities. Thousands of acres were cleared of bush, and valuable grazing veld was ploughed in order to make cotton lands in such parts of the country as the northern Transvaal and northern Zululand. Owing to the impossibility of

economic production by reason of unsuitability of the areas, vast tracts now lie bare, covered with very poor grazing or invaded by thorn scrub to such an extent that the land is useless for any purpose (see Photo 4).

In the case of wool, the high prices for the product led to stocking far beyond the carrying capacity of the veld, and to sheep farming in totally unsuitable areas (see Photo 2). Land values in the Cape Province and the Orange Free State soared to such an extent that extreme exploitation was necessary in order to obtain interest on the money invested.

In the case of maize, thousands of acres in all parts of the country were put under the plough. For a few years, while good prices were realized, and while the land was still productive, good crops were obtained in the western Transvaal and in parts of the Orange Free State. As prices dropped, it became economically unsound, even with improved methods of farming, to produce maize. These areas now lie abanoned, (see Photo 3) and the re-vegetation of such lands is a very serious problem.

In the majority of cases where there has been a boom, the areas which were suited to the production of the commodities required, have suffered very little, except from the high valuation of the land. It is those areas where conditions were not suitable for economic production that most damage was done to the land and vegetation, and where most failures occured.

(*b*) *Local Markets and Government Assistance.*

Many local markets are created to help the farming community or a particular district (e.g. in the case of dairying). If conditions are not studied very carefully, however, results such as those following on world boom are often obtained. Good prices are usually paid for products when a new market is opened in order to encourage the production of the necessary supplies. At these high prices, with the farmer and the veld not yet exploited, it is possible to produce econmically. Once the supply is forthcoming, prices drop and, in order to get the same returns, the farmer exploits his land. Usually, when the farmer finds himself in this position, he tries to improve his farming by using better methods but, if his vegetation is not suited to that type of farming, the cost of improvement is more than he can afford. Production costs increase, and in order to remain on the land he has to seek the aid of the Government. This may be obtained in the form of subsidies which provide him with facilities to carry on along the same lines and thus denude his vegetation and impoverish his soils still further.

If it were not for the subsidy on maize, large tracts of country which, to-day, are marginal maize-producing areas, would not be under the plough at all. The cost of production would have been too high, and the farmer would have turned to a type of farming better suited to his particular area. With research directed at lowering the cost of production and the discovery of better methods of farming, as well as assistance in connexion with marketing, he has exploited his land still further and yet his farming is on no sounder a basis.

In order to obtain the subsidy on wool, sheep are often run in tall-grass areas or areas in which the vegetation is unsuitable. If the veld is to be maintained, sheep do not thrive on it. Various methods are employed to manage the veld in such a way that the sheep will thrive and these always react to the detriment of the vegetation and the land.

Dairying and dairy ranching are found in areas quite unsuited from a vegetation point of view, and it is always the veld and land that suffer.

The Value and Application of Botanical Survey.

It is a well-known fact that vegetation is a reliable indicator of climatic and soil conditions. In other countries ([7]), ([8]), ([9]), use has been made of this fact in determining the agricultural possibilities of land by the study of its vegetation. In this country, too, a study of the various vegetation types would be of the utmost value in determining the suitability of areas for particular types of farming.

Farming is a business and should be treated as such. With the starting of a business or a factory, careful consideration is always given to factors such as the availability of power, water, transport, markets and other facilities. Were a business man to start a factory in an unsuitable area, and it failed owing to bad selection of site, he would be regarded as a bad business man. On the other hand, if a farmer embarks on a wrong type of farming for his particular area, he is regarded as unfortunate and worthy of help, even if it is to assist him on the wrong farming system which will end in the denudation of his veld and the ruination of his land.

If the country were surveyed botanically in detail as regards vegetation type, and if this were correlated with a survey of the farming systems that could be applied to these vegetation types without exploitation or damage to the country, definite recommendations could be made as to the farming systems to be fostered in the different areas.

To put South African farming on a permanent basis, the only sound foundation would be to apply farming systems on those vegetation types to which they are suited, and this can be done only if the country is surveyed in detail and the vegetation types correlated with the farming systems. This would enable men farming on these lines to produce economically without damage to land and veld. Not only would it then be possible to make farming pay for a few years, but agriculture would be placed on a sound and permanent basis.

At present the attention of the country is directed to the reclamation of denuded and eroded areas. If, on the other hand, the chief consideration were the preservation, maintenance, and improvement of our still undamaged vegetation and soils, it would not only be possible to retain what there is at present but, by preventing further denudation, the reclamation of areas would follow a natural sequence.

If subsidies and other aid were then directed to put the farmers in the recommended areas on a sound footing and no help were given

to those farming on the wrong lines, there would be no fear of the marginal areas causing over-production and a glut on the market in good years.

Gradually, too, land values would find a level commensurate with the productive value of the areas and would not, as at present, be governed by their speculative value. Furthermore, prospective buyers of land would be able to go to definite areas to buy land to carry out the type of farming which they specially favour, with every hope of success.

Mapping of the Estcourt Area.

To illustrate how a vegetation survey such as recommended above could be carried out, the following description of the Estcourt area together with the findings and recommendations is given.

In the study of the vegetation of this area, the following points were observed:—

(*a*) Number of Vegetation Types.
(*b*) Area of each type.
(*c*) Climatic conditions prevailing in each type.
(*d*) Soils and topography of the country in which each type occurred.

It was found here that the area could be divided into four main vegetation types (see Map 1). Within each are sub-types, but these are small and could all be classed within the main types. The areas are:—

(1) Thorn or bush veld.
(2) Tall grass veld.
(3) Highland sourveld.
(4) Mountain veld.

Once the area of each type had been mapped, an investigation was conducted into the farming systems already employed, those that are possible, the effects of these systems, and the costs of production.

(*a*) in connexion with each type separately, and
(*b*) in connexion with a combination of types in order to discover whether, together, they could not form a complete farming unit.

(1) *Thorn Veld.*

On the whole, the rainfall in the thorn veld is low and badly distributed, occuring in heavy storms. The grasses are tall, sweet and of high feeding value. Even when dry and dormant, they maintain stock in good condition.

The carrying capacity of this veld is low owing to the fact that, with badly distributed rainfall, the cover is sparse. Owing to the nature of the country, there is little scope for the making of reserve feeds such as hay and ensilage. The country is not only very stony and hilly, with deep, narrow valleys (see Photo 1) but it is also covered with thick bush which would have to be cleared before the

land could be utilized for mowing. Bush is particularly thick in the valleys where the soils are deep and rich and where the most level ground occurs.

Crop farming on a large scale is a gamble owing to the low and erratic rainfall, the hilly and stony nature of the country, and the need for bush clearing in the valleys before anything can be done. Owing to the rugged nature of the country and the heavy downpours of rain during storms, cultivation of land on the slopes or in the valley basins would lead to excessive erosion (see Photo 5) unless expensive methods of erosion prevention and control were undertaken.

From the point of view of the vegetation as well as the topography of the country, it can be justifiably asserted that this is a stock and not a crop-farming area.

From a sheep-farming aspect, there are various drawbacks. Firstly, the grasses are tall and, since sheep do not thrive in tall grass, it is necessary to keep the grass short. This is done by means of fire or over-stocking. When the veld is kept short, not only do the grasses tend to disappear, but the run-off is accelerated during heavy storms owing to lack of cover, and bad erosion sets in. With this heavy run-off, very little water penetrates the soil, with the result that the grasses die still further owing to lack of moisture. The country is thickly bushed and the thorns would do much damage to woolled sheep. Water is scarce and entails long treks for the sheep, leading to tracks as a starting point for erosion. All these factors show that the thorn veld is not suitable for sheep farming.

On the other hand, this country is suitable for cattle farming. Cattle thrive well in this tall-grass country (see Photo 6), the bush does not hamper them to any extent, and they are capable of covering the long distances to the water. The carrying capacity, as stated above, is low. Unless this is realized and unless the land is stocked accordingly, denudation and erosion are bound to follow. By correct veld management, however, cattle can be maintained in excellent conditions all the year round without damage to the vegetation. Such management would consist of proper allocation of summer and winter grazing camps according to the topography of the country.

The type of cattle farming best suited to this area requires careful consideration. Dairying is out of the question, because of the low carrying capacity of the veld and the lack of suitable arable land for producing supplementary feed.

If ranching were carried out in the usual way, each farmer would have to have a very large tract of land to carry sufficient animals to ensure a reasonable income. Should he, however, go in for the breeding of weaners only, his farm could be much smaller since he would have only breeding animals instead of cows, weaners, two and three year old animals. By replacing the two and three year olds by breeding cows, he would require fewer herds and fewer camps. In consequence, his cost of production would be lower and the number of animals produced annually on the same area would be greater. This type of farming would be well suited to the thorn or bush veld area where large numbers of weaners could be produced annually.

(2) *Tall-Grass Veld.*

The change from the thorn veld to the tall-grass veld is very marked. The altitude, topography of the country, climate, and soil conditions alter considerably. The rainfall is better and more evenly distributed, the grass is taller and denser, and trees are conspicuous by their absence. The grasses do not have the same high feeding value throughout the year as those in the thorn country. In the young stage they are highly nutritious but, as the season advances, their food value drops (see Photo 7). The rich soils of the thorn veld give way to poorer soils, and large rolling plains replace the stony hills.

Superficially, the area, with its open plains and good, well-distributed rainfall, appears to be ideally suited to crop farming (see Photo 8). On a close inspection, however, it is soon realized that crop farming, unless carried out on intensive and highly scientific lines, is unsound. In most parts of the area, there is a superficial, shallow layer of top soil (see Photo 9). Below this are highly erodable subsoils which, when exposed, erode at an alarming rate (see Photos 10-15). In many parts, deep dongas up to 30 feet in depth, eating back and out every year, are visible in the cultivated areas of most farms (see Photo 16). The soils are poor and large quantities of fertilizer are necessary in order to obtain good crops. It therefore appears that this area is not really suitable for large-scale arable farming, owing to cost of production and the danger of erosion following on cultivation. On a small scale, under highly scientific methods, such as strip planting, contouring, use of organic fertilizers etc., crops could be produced for farm use. On a commercial scale, arable farming here could not be compared with that in the real crop-producing areas where there is rich, non-eroding soil of great depth.

The vegetation as well as the lay of the country is admirably suited to stock farming. Sheep farming here is not practicable, for the same reasons as in the thorn veld, for this is tall-grass country. If sheep farming were to be carried out without permanent damage to the country, it would entail the changing of the veld to suitable pasture which could withstand the requirements of sheep. This would entail the laying down of pastures on a large scale, which would increase the cost of producing wool or mutton beyond the cost in areas suited to sheep.

The conditions are suited to cattle farming but, here again the type of cattle farming has to be carefully considered. The vegetation, the soil, of which the vegetation again is an indicator, and the climatic conditions are the factors to be borne in mind.

The climatic conditions are such that very definite growing periods are experienced and equally definite long dormant periods, during which the grasses are of little value. During the summer, the grasses make very rapid growth and have a high feeding value which decreases as the season advances. This means that, in contrast to the thorn country, the summer carrying capacity is far in excess of the winter carrying capacity, and that the latter has to be raised by utilizing surplus growth of grass in the summer for conservation as hay and ensilage.

When considering the types of cattle farming best suited to this vegetation type, there are many disabilities for dairying. The dairy cow demands an even feed of high nutritional value throughout the year. This is not easy to obtain here, since the climatic conditions are of such a nature that the veld has a high feeding value for a very short period only. The supplementing of this veld by the production of crops is difficult without exploitation, owing to the scarcity of really good arable lands. The exception, as in the other veld types, occurs where irrigation is possible for the production of high-quality pastures on the deep alluvial soils along some of the rivers. It is held that pastures under irrigation on these soils should produce all the milk in this area.

The remaining types of stock farming to be considered are ranching and the grazing of steers. Ranching or the breeding of stock here does not compare with that in the thorn veld owing to the long dormant season during which the breeding cow has to be maintained in good condition. Here it is difficult on account of increased cost of production above that of the thorn veld, where the grass has a high feeding value throughout the year. The type of vegetation, the lay of the land, and the climatic conditions make for a seasonal type of farming i.e. the grazing of the veld in the summer and the carrying of animals through the winter by means of hay and ensilage produced from the surplus growth of the veld. This is termed *annual farming* in that the farmer will draw on the thorn veld for weaners, but his numbers will vary from year to year according to the quantity of conserved feed available for the winter. If he were, to go in for breeding, this variation in numbers would be impracticable. It is therefore considered that the tall-grass veld is suitable for the growing out of steers produced elsewhere.

(3) *Highland Sourveld.*

The last type of vegetation in this area of any value from a farming point of view is the highland sourveld. This area differs from the thorn veld in that it is situated at a higher altitude, has a higher rainfall, and the grasses are shorter and much denser (see Photo 17). The growth in the summer is exceedingly rapid and, while the grasses are young, they are very nutritious but they mature soon. After maturity, they are unpalatable, and have very little food value.

The climate is exceedingly severe. Bad hailstorms are common in summer and snow may be expected any winter. Soils are poor and can seldom be cropped economically for more than a few seasons. The growing season for veld or crops is very short and the dormant season is rigorous.

This is the most difficult of the areas for which to prescribe a farming system. Any system would have to be highly intensive on account of the factors mentioned above.

With regard to crop production, the soils are so poor that a great deal of building up is necessary even to carry pastures. This rules out economic crop production on a large scale.

Stock farming in the area will depend on the quantity of feed that can be conserved from the veld in summer to carry the stock over the long winter months. This militates against dairying in which a steady feed of high value is required throughout the year. The vegetation is such that it will permit of sheep farming, but the question of winter feed and the type of sheep—wool, mutton or fat lamb—will have to be investigated carefully. If, under intensive conditions, the building up of soil to carry high-producing pastures is possible, fat-lamb production is worthy of consideration.

Under prevailing conditions, where the carrying capacity of the veld is extremely high for a few months of the year and it is possible to conserve large amounts of veld grass as hay and ensilage, the possibility of intensive production of well-bred beef types should be considered. The heifers and bulls would find a market with the breeder in the thorn veld while surplus food could be used for the production of a limited number of steers. Like the thorn veld farmer, the farmer in the highlands would dispose of every animal, apart from his breeding stock, as soon as possible. In the one case there is a low carrying capacity combined with good grasses throughout the year which makes conditions suitable for extensive farming, while, in the other, there is a short growing period during which the carrying capacity is very high and during which large quantities of reserve feed must be conserved. This area is of necessity suited to intensive farming.

(4) *Mountain Veld.*

The last vegetation type of this area is the mountain veld. From a farming point of view, it is of little use. The slopes of the mountains are steep (see Photo 18) and the grazing is poor. Climatic conditions are so severe as to make permanent farming impossible.

This area, however, is of the utmost importance to the country as a whole. The sources of the rivers (see Photo 19), the high-lying vleis and sponges (see Photo 20) which ensure a steady flow of water to the rivers throughout the year, all fall within this vegetation type. It is therefore all-important that this area be so managed that the permanent supply of water to the rivers is maintained. Without this, any system of farming in the areas below will suffer.

Organization of the Farming Systems as Definite Units.

From the above descriptions of the vegetation types and the farming systems which can be employed in this area in such a manner that the type of farming is suited to the vegetation, it can be seen that the farming could be so organized that each man would have a ready market for his products and each man could farm without exploitation of his land. All together would make a complete unit for beef production. The farmer in the highland sourveld would produce the breeding stock for the breeder in the thorn country. The breeder there would produce weaners for sale to the grazier in the tall-grass veld and he would supply an animal well grown out, ready for feeding for export.

It must be remembered that, in this survey, the main system of farming for each vegetation type has been outlined, but this does

not mean that there are not subsidiary lines of farming falling in with the main system which should not be practised at the same time.

Vegetation Survey of South Africa.

If a survey similar to that carried out in the Estcourt district as described above, were made for and applied to the whole country, the writer feels that the agricultural outlook of the Union would be far brighter. The Botanical Survey has done an immense amount of work on the flora of the country and much has been published from a purely botanical point of view. If this were correlated with farming systems, a large staff would not be required to carry out a detailed survey of the whole Union, dealing with every possible type of farming. The tendency in agricultural surveys has been to map the country into farming areas based upon the number of farmers carrying out a particular type of farming in each district, the amount produced, and the cost of production. This may show what types of farming are being carried on to-day (see Map 2), but whether the farmer can continue to produce the same commodity economically for any length of time will depend entirely on the system being suited to the vegetation and soil. To-day he may be farming profitably at the expense of the land, but that does not make for permanent farming. It is therefore stressed that these surveys should be based, not on the amount produced at present and the cost of production, but on the suitability of the vegetation and soils for *permanent farming* of any particular type. Once the farming system for any area has been settled, research can be directed towards the economic production of the commodities suited to the particular vegetation and soil conditions.

The writer, from knowledge gained on botanical-survey trips throughout the whole country, has drawn up a rough map showing how it would be possible to divide the country on lines such as has been done at Estcourt. The map is far from correct in detail but it will serve to show the possibilities of such a survey (see Map 3).

Application of the Vegetation Survey.

The application of such a survey would be of the utmost value to the country from many points of view:—

(*a*) It would help to stabilize farming according to the vegetation type on a sound basis.

(*b*) By getting the farmer to farm along lines suited to his vegetation, it would strike at the root and cause of the soil-erosion problem.

(*c*) The farmer in a particular vegetation type would become a specialist in his particular line of farming.

(*d*) As shown in the discussion on the Estcourt area, internal markets could be developed for the various products and thus a steady supply of the finished product could be ensured

(*e*) Booms in particular commodities would affect only the areas suited to their production.

(*f*) Agricultural advisory officers would be able to specialize in the problems of their particular areas.

(*g*) Lines of research work on farming problems would be laid down to assist the farmer in the improvement of his land, and not to assist him to keep his head above water when he is farming on entirely wrong lines.

Summary.

The writer has stressed the need for a careful, detailed vegetation survey of the Union, correlated with the farming system in each vegetation type. He has discussed a survey carried out in the Estcourt area and has shown how the application of such a survey would help to put South African farming on a sound and permanent basis.

Acknowledgments.

The writer wishes to thank Dr. I. B. Pole Evans, Chief of the Division of Plant Industry and Director of the Botanical Survey, for the facilities afforded for work in the Estcourt area and on the botanical survey. He is also grateful to Mr. J. D. Scott, Pasture Research Officer, Estcourt, for photography and help in the preparation of this paper and to Miss K. Lansdell of the Division of Plant Industry for assistance in the preparation of the maps.
27th October, 1937.

BIBLIOGRAPHY.

(1) "The Use and Misuse of Land", by C. J. R. Gorrie, Oxford University Press.

(2) "The Land To-day and To-morrow", by R. G. Stapledon.

(3) "Proceedings of the National Conference on Land Utilisation". United States Government Printing Office, Washington.

(4) "A Vegetation Map of South Africa", by I. B. Pole Evans, Botanical Survey of South Africa, Memoir No. 15.

(5) "The Veld and its Resources", by I. B. Pole Evans, *South African Journal of Science*, Vol. XVII, November.

(6) "Agriculture Policy in S.A.", by H. D. Leppan, Central News Agency Ltd., S.A.

(7) "Importance of Plant Ecology with regard to Agriculture", by L. Cockayne, New Zealand Journal of Agriculture, 1919.

(8) "Natural Vegetation as an Indicator of Capabilities of Land for Crop Production in the Great Plains Area", by H. L. Shantz, U.S. Department Agricultural Bureau of Plant Industry, Bull. 201.

(9) "Plant Ecology", Chapter XVII, Weaver and Clements, McGraw Hill Book Co. Inc., New York.

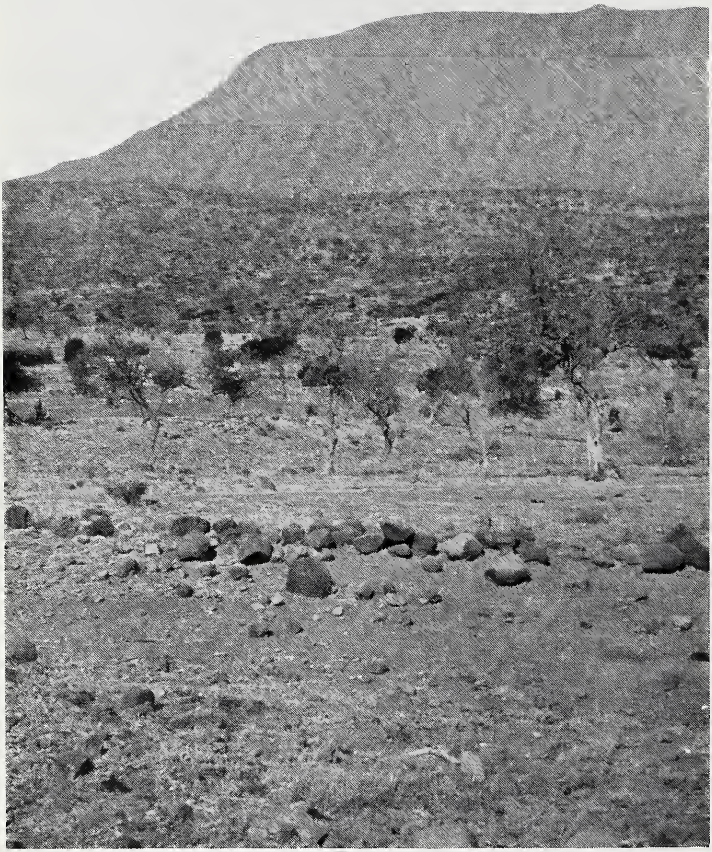


Photo 1.—Thorn veld showing stony, hilly country with deep narrow valleys.

Photo 2.—Effect of sheep farming in unsuitable areas. Note bareness of ground and invasion by "Bitter Karroo".

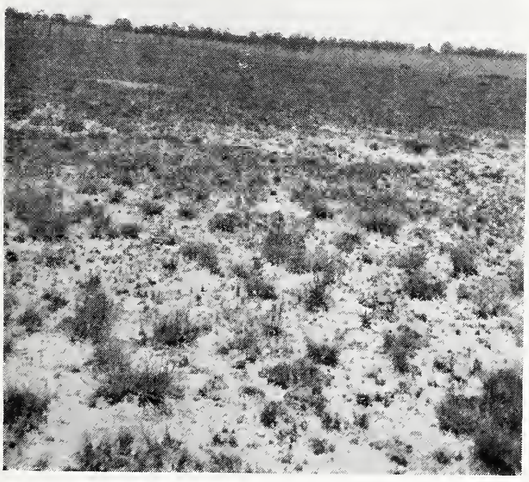


Photo 3.—Good veld broken up for maize production in an unsuitable area for maize. These lands are now abandoned. Note poor type of vegetation and sparseness of cover.

Photo 4.—Lands once under cultivation now eroded and covered by dense thorn scrub with little or no grass cover.

Photo 5.—Excessive erosion on abandoned cultivated lands in thorn veld.

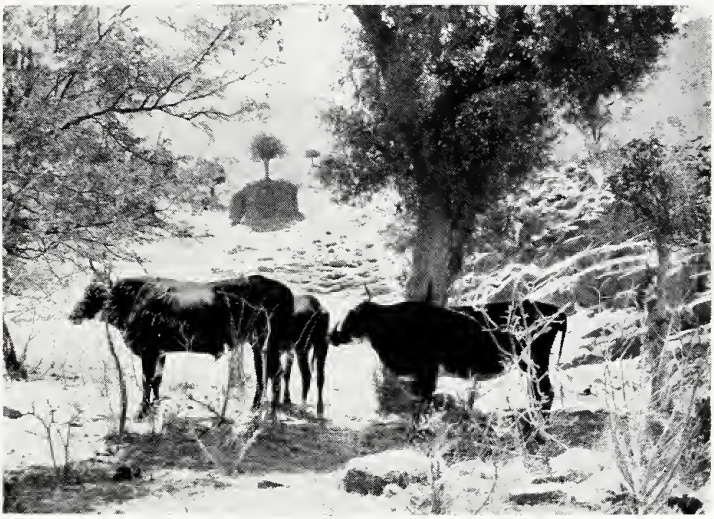


Photo 6.—Excellent condition of native cattle in thorn veld at the end of winter showing that the veld in this area can maintain stock in good condition throughout the year.

Photo 7.—Poor condition of native cattle in the tall-grass veld at the end of winter although abundant grass is available. Contrast with cattle in the thorn veld on same date (Photo 6).

Photo 8.—The rolling plains of the tall-grass veld showing extent of cultivation.

Photo 9.—Erosion in tall-grass veld caused by ploughing and disturbing of the shallow top soil. Note the very definite shallow layer of topsoil and the erodable subsoils.

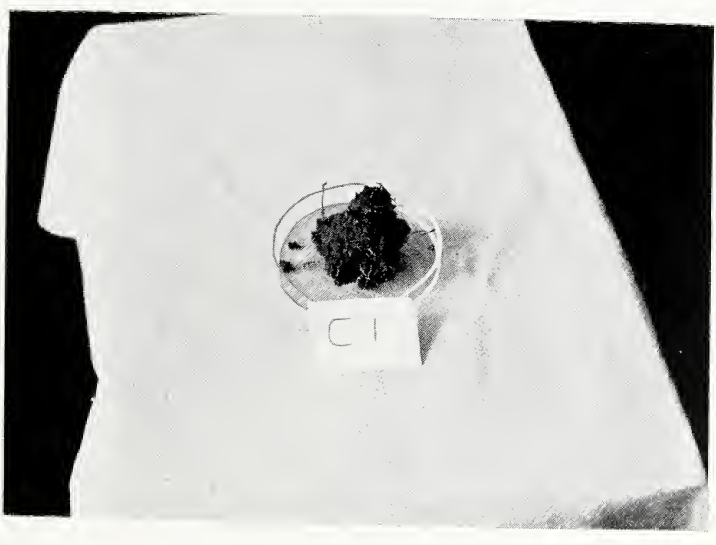


Photo 10.—Top soil from the tall-grass veld before immersion in water.

Photo 11.—The same tops soil as in Photo 10 after immersion in still water for one hour. No breaking down of the top soil can be seen.

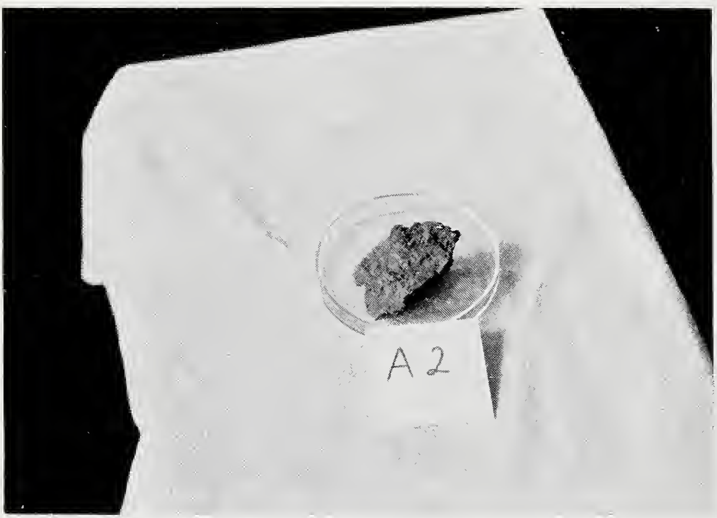


Photo 12.—First layer of subsoil from tall-grass veld before immersion in water.

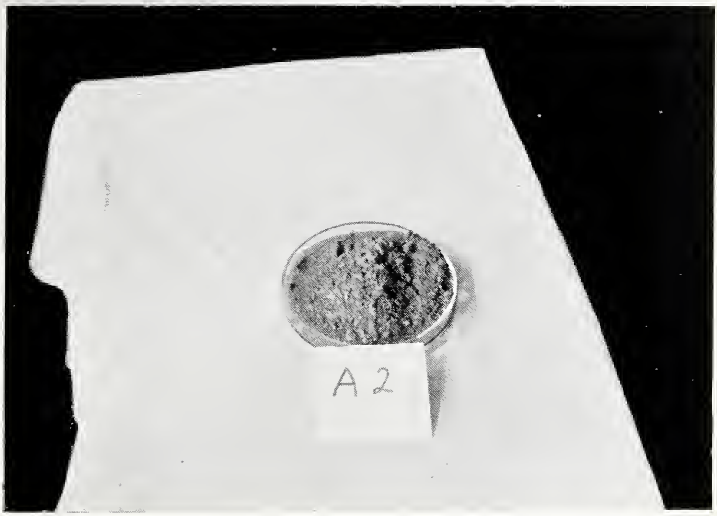


Photo 13.—Same subsoil as Photo 12 after immersion in still water for one hour. Within ten minutes of immersion the whole sample had completely broken down as shown, demonstrating its extreme erodability.

Photo 14.—Shale underlying subsoils in tall-grass veld, before immersion in water. (Same shale as in Photo 16.)

Photo 15.—Same shale as in Photo 14 after immersion in still water for one hour. This shale broke up completely as shown within 25 seconds after immersion.

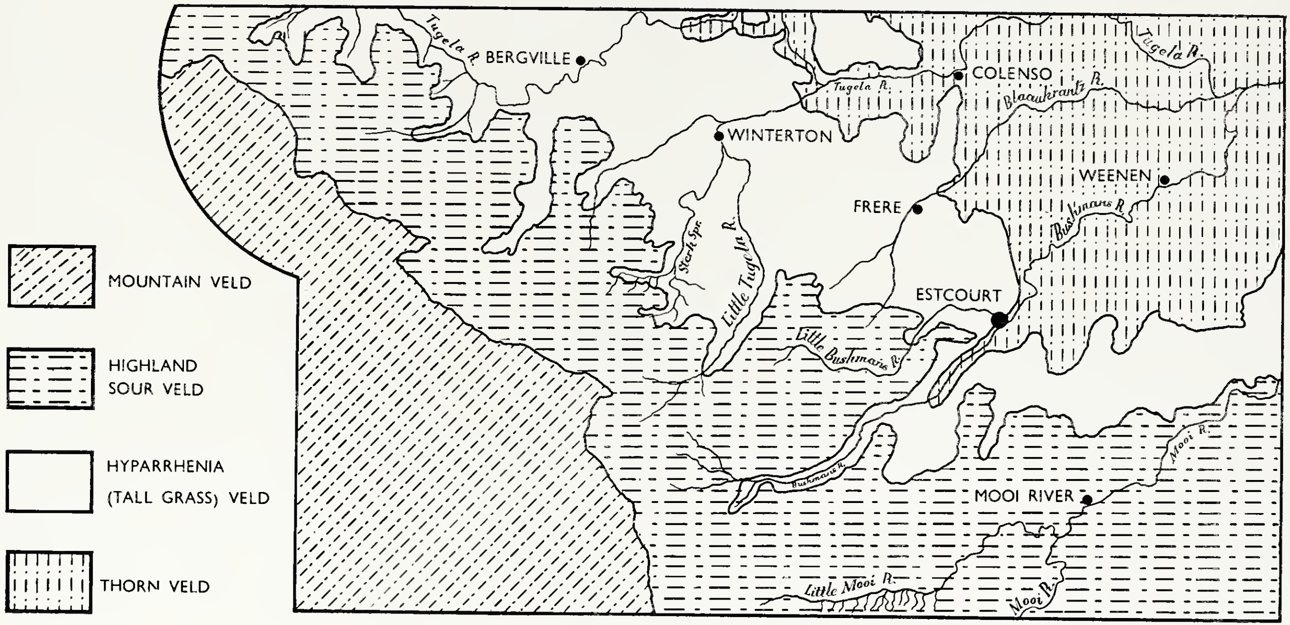
Photo 16.—Erosion in tall-grass veld, showing thin layer of top soil and various layers of erodable subsoils.

Photo 17.—Highland and sourveld.

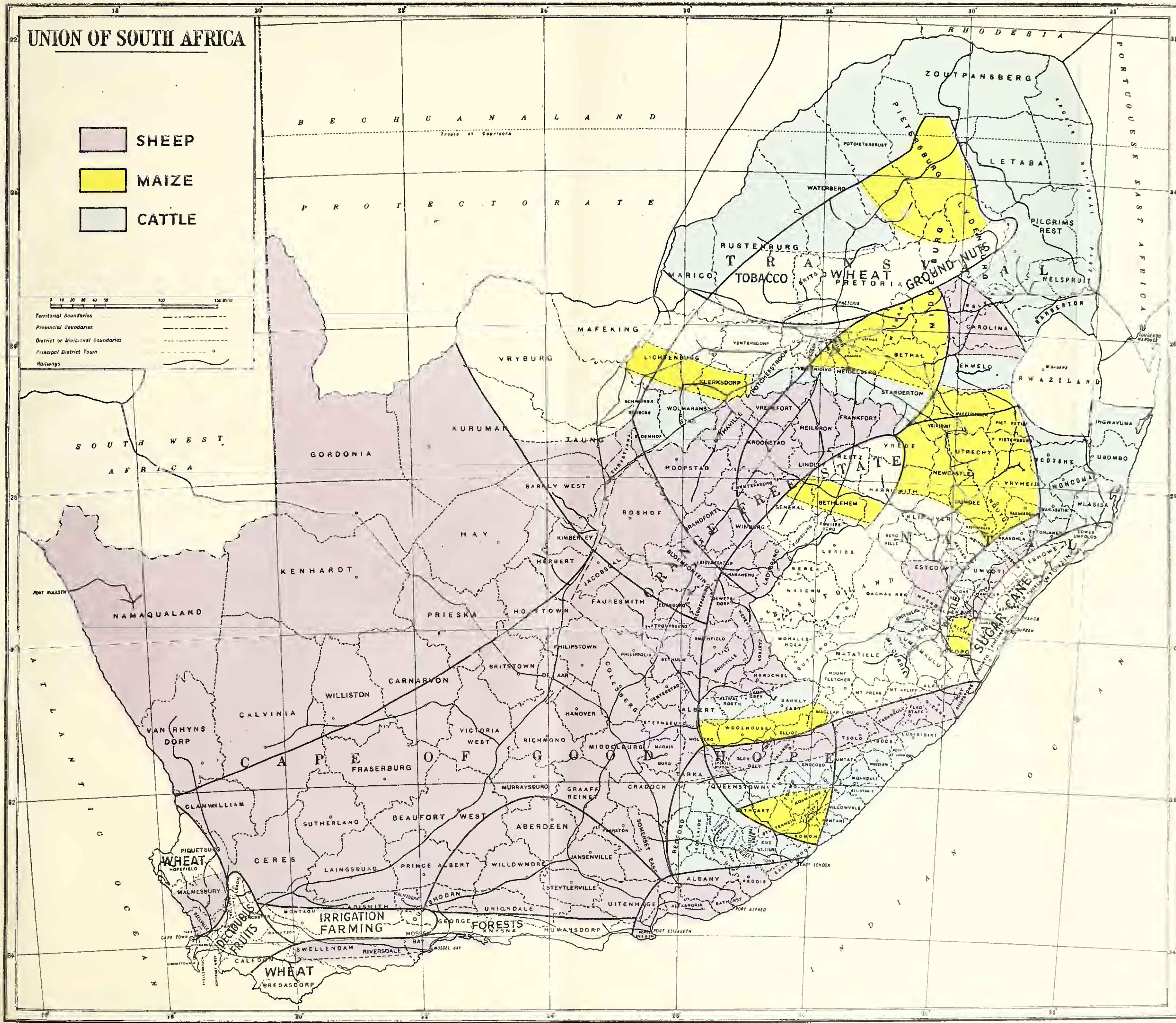
Photo 18.—View of mountain veld in background, showing steep nature of the country.

Photo 19.—The source of the Lumbonjwa River in the mountain veld.

Photo 20.—View of high-lying vleis and sponges in the mountain veld below the Little Berg.


MOUNTAIN VELD
HIGHLAND SOUR VELD
HYPARRHENIA (TALL GRASS) VELD
THORN VELD
BERGVILLE
COLENSO
WINTERTON
WEENEN
FRERE
ESTCOURT
MOOI RIVER
Tugela R.
Blaauwkrantz R.
Bushmans R.
Stark Spr.
Little Tugela R.
Little Bushmans R.
Mooi R.
Little Mooi R.

MAP I.



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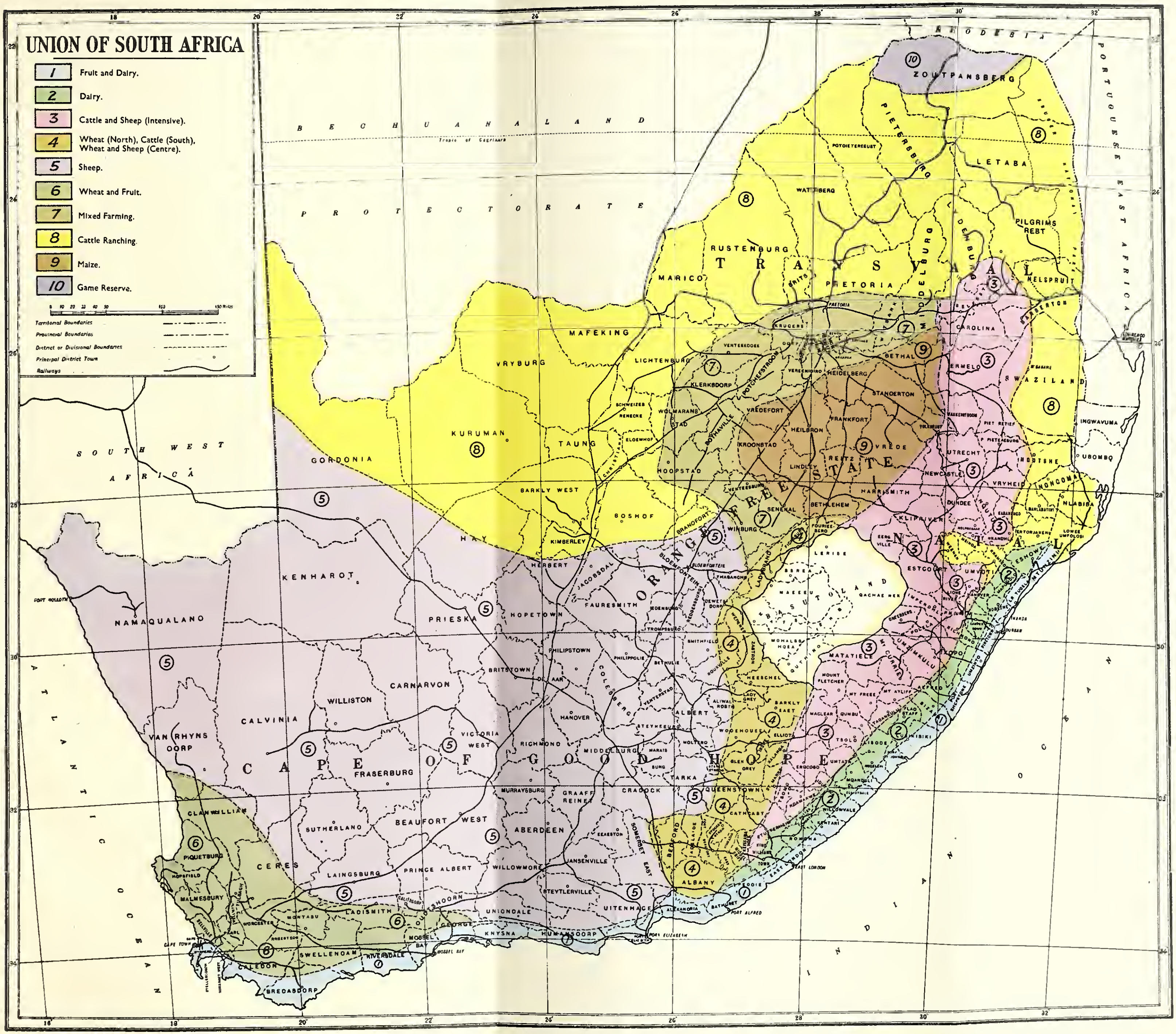
MAP 2.— DISTRIBUTION OF AGRICULTURAL SYSTEMS AS AT PRESENT.



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MAP 3.— DISTRIBUTION OF AGRICULTURAL SYSTEMS ACCORDING TO VEGETATION.

BOTANICAL SURVEY OF SOUTH AFRICA

MEMOIR No. 20

CHECK-LIST OF THE FLOWERING PLANTS

OF THE DIVISIONS OF

GEORGE, KNYSNA, HUMANSDORP, AND UNIONDALE

by

H. G. FOURCADE, D.Sc. F.R.S. (S. Afr.)

Price 2s. 6d.

PRINTED IN THE UNION OF SOUTH AFRICA BY THE GOVERNMENT PRINTER, PRETORIA

1941

G.P.-S.910—1940—708

UNION OF SOUTH AFRICA

DEPARTMENT OF AGRICULTURE & FORESTRY

DIVISION OF PLANT INDUSTRY

Botanical Survey Memoir No. 20

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G.P.-S.910—1940—708

UNION OF SOUTH AFRICA.

Department of Agriculture and Forestry,
Division of Botany and Plant Pathology,
P.O. Box 994,
Pretoria,
9th *January*, 1940.

The Secretary for Agriculture and Forestry.

Sir,

I have the honour to forward herewith the manuscript of a paper entitled " A Check-List of Flowering Plants of the Divisions of George, Knysna, Humansdorp and Uniondale " prepared by Dr. H. G. Fourcade.

This Memoir will form a continuation of our knowledge of the flora of the south eastern Cape Province. The previous Memoirs dealing with the area are " The Phanerogamic Flora of the Divisions of Uitenhage and Port Elizabeth ", by S. Schonland; " The Vegetation of the Riversdale Area ", by J. Muir; " The Vegetation of the Division of Albany and Bathurst ", by R. A. Dyer.

Dr. Fourcade has studied the flora of the area covered by the present Memoir for many years and has personally checked the names of the plants referred to in his list by visits to the Herbarium of the Royal Botanic Gardens at Kew.

In all problems dealing with veld management, the first essential is to know the local flora and the present Memoir and those mentioned above supply the necessary fundamental information.

I have the honour to be,

Sir,

Your obedient Servant,

(Sgd.) E. PERCY PHILLIPS,

Director, Botanical Survey.

Check-List of the Flowering Plants of the Divisions of George, Knysna, Humansdorp, and Uniondale in the Cape Province.

The catalogue subjoined was originally compiled from the records of existing literature, its purposes being to aid in the collection of the plants of the region and to facilitate the exchange of specimens. It then grew to much larger dimensions by the incorporation of additional species represented in my own herbarium and various other herbaria in South Africa and Europe.

With few exceptions, *Orchidaceae*, *Iridaceae*, and *Mesembryanthemeae* collected by me were determined or checked by Dr. H. L. M. Bolus, *Ericaceae* by Miss L. Guthrie, *Compositae* by Dr. J. Hutchinson, *Proteaceae* by Dr. E. P. Phillips, *Crassulaceae*, *Cyperaceae*, and *Rhus* by Dr. S. Schonland, *Gramineae* by Miss S. Stent, *Celastraceae* by Miss J. D. Davison, *Gnidia* by Mrs. M. Moss, *Nemesia* by Dr. A. L. Grant, *Restionaceae* and *Phylica* by Mr. N. S. Pillans, *Aspalathus* by Miss S. Garabedian, and *Oxalis* by Paymaster-Captain T. S. Salter, to all of whom my grateful thanks are due.

I am also much indebted for kindness and assistance to the following :—

Sir A. W. Hill, Director of the Royal Botanic Gardens, Kew, for allowing me to work, over long periods, during three of my visits to England, in the Kew Herbarium where I received valuable assistance in determinations from the late Dr. O. Stapf, Mr. C. E. Hubbard, Dr. J. Hutchinson, Mr. P. J. Greenway and Mr V. S. Summerhayes. Also from Miss I. Verdoorn, Mr. C. A. Smith and Dr. R. A. Dyer, who successively represented South Africa at Kew.

Dr. J. Ramsbottom, Keeper of the Department of Botany, British Museum (Natural History), for permission to examine the material there, and for similar facilities in the Herbiers Decandolle, Delessert and Boissier, to Dr. B. P. G. Hochreutiner, Directeur des Musée, Conservatoire et Jardin Botaniques de la ville de Genève. For comparisons by Dr. R. Knuth of many of my specimens of *Pelargonium* I am indebted to the good offices of Dr. R. Diels, Director of the Botanisches Museum, Berlin–Dahlem. Dr. H. Weimarck, of the Lund Botaniska Museum, was kind enough to include most of my specimens into his revision of *Cliffortia*, and Dr. T. Norlindh to supply me with advance notes of his revision of *Osteospermum* and photographs of types. The late Dr. N. E. Brown was also very helpful in critically examining some of my *Iridaceae* and *Mesembryanthemeae*.

In South Africa, by courtesy of Dr. H. M. L. Bolus, Curator of the Bolus Herbarium, Dr. L. Gill, Director of the South African Museum, and Dr. J. Hewitt, Director of the Albany Museum, I was privileged to be given the freedom of their respective herbaria, a permission of which I made full use. In the Bolus Herbarium there are numerous types of the species described in the later volumes of the Flora Capensis, and many of the numbers there quoted. In the S.A. Museum there is a considerable set of Ecklon and

Zeyher's plants and a large number of plants named by Harvey while working on the first three volumes of the Flora Capensis. In the Albany Museum collections in the region covered by the present list are well represented. Apart from types and quoted numbers, it was found from the later comparisons in European herbaria that more than a few of the traditional names in S.A. herbaria, which had been arrived at from insufficient descriptions, were, at the time, incorrect, although this has been largely remedied since. But in groups in need of revision, particularly in some genera of the *Liliaceae*, no approach to complete accuracy is yet possible.

Among botanists, not already mentioned, who have afforded me help in various ways, are the late Professor C. E. Moss, the late Dr. R. Marloth, Professor R. H. Compton, who described some of my new *Ericae* and named other plants, and, in the Bolus Herbarium, Miss. W. Barker, Miss M. Lavis, Miss F. Leighton and Miss J. Lewis.

For contributions of specimens collected in the region I am indebted chiefly to Mr. J. D. Keet, Archdeacon F. A. Rogers, Dr. T. Jeppe, Dr. A. V. Duthie, Mr. F. S. Laughton, Mr. F. R. Long and the National Herbarium, Pretoria.

A similar catalogue was begun, many years ago, in collaboration with Dr. S. Schonland, who determined a large number of the plants of my earlier gatherings, as also did the Bolus Herbarium, but it soon became apparent that much more extensive collecting and examination of collections would be requisite before a tolerable list could be compiled, and evident that many of the names then current could not be maintained. For these reasons, the joint attempt was abandoned after covering the first two volumes of the Flora Capensis and a small portion of the third. The great increase of entries in the present list and numerous corrections to the older attributions have amply justified the decision then taken.

The manuscript of the present list enumerates for each species the specimens collected by myself and by others. These references are omitted from the printed copy as being outside the purposes of a check-list ; also for reasons of space, and because it would still be premature to issue a more complete account, having regard to the number of revisions in progress and to the additions and corrections which may result from the further collecting which it is hoped the publication of the list will stimulate.

The footnotes are limited, for the most part, to the names, when they differ, under which the species are described in the Flora Capensis. The text is purposely left clear of these in order to allow of room for the sorting and compilation of notes such as of periods of flowering and fruiting, additions to distribution, desiderata, etc.

PRINCIPAL COLLECTORS IN AREA.

Nov.–Dec., 1772..	Thunberg, Carl Peter. George, Knysna, Kromme River, Gamtoos, Long Kloof.
Nov.–Dec., 1773..	Thunberg, Carl Peter. Longkloof, Kromme River, Gamtoos, Uniondale Karroo.
Nov.–Dec. 1772...	Auge, Johannes Andreas. With Thunberg on his first journey.
Nov.–Dec., 1773...	Masson, Francis. With Thunberg on his second journey.
Sept.–Dec., 1775..	Sparrman, Andreas. Knysna, George, Long Kloof, Kromme River, Gamtoos.
Dec., 1777.......	Paterson, William. George.
Jan.–Mar., 1779...	Paterson, William. Long Kloof, Kromme River, Gamtoos.
1798–1803........	Niven, James. George, Knysna, Long Kloof, Kromme River, Gamtoos.
Dec., 1803........	Lichtenstein, Heinrich. George, Knysna, Long Kloof, Kromme River, Gamtoos.
Feb.–Oct., 1814...	Burchell, William John. Gamtoos, Kromme River, eastern Long Kloof, Knysna, George.
1812–22..........	Bowie, James. George, Knysna, Avontuur, Long Kloof, Uniondale Karroo.
1831–33..........	Drège, Jean Francois. George, Knysna, eastern Long Kloof, Kromme River, Gamtoos.
1830–32..........	Ecklon, Christian Friederich and Zeyher, Carl. George, Knysna, Long Kloof, Kromme River, Gamtoos. Zeyher also visited Uniondale Karroo, in 1840, with Burke.
Jan.–April, 1839..	Krauss, Ferdinand. George, Knysna, Kromme River, Lower Zitzikamma.
Aug.–Sept., 1847...	Prior–Alexander. George.
Nov., 1870.......	Bolus, Harry. Avontuur, De Vlugt, Uniondale Karroo, Knysna.
—	Bolus, Harry. George.
1875–80..........	Rehmann, Anton. Knysna, George.
July–Dec., 1893...	Newdigate, Caroline. Forest Hall.
Mar.–April, 1893..	Schlechter, Rudolf. George.
Nov., 1894.......	Schlechter, Rudolf. George, Knysna, Zitzikamma, Gamtoos.
Nov., 1894.......	Penther, A. Zitzikamma, Knysna, George.
Nov., 1894.......	Krook, P. Collected with Penther.
Sept., 1897.......	Galpin, Ernest E. Zitzikamma, Knysna, George.
—	Paterson, Florence (Mrs. T. V.). George, Hankey.
Nov., 1911 – Jan., 1912	Paterson, Florence (Mrs. T. V.). Hoek Plaats (Uniondale Karroo).
Aug., 1912........	Rogers, Rev. F. A. Humansdorp, Assegai Bosch, George.

Dec., 1917 – Jan., 1918	Britten, Lilian. Hoffman's Bush, Assegai Bosch.
1917–22..........	Keet, J. D. Knysna.
—	Schonland, Selmar. Humansdorp, Long Kloof.
Dec., 1919 – Jan., 1920	Schonland, Selmar. Knysna, Zitzikamma, Kromme River.
1921–............	Duthie, Augusta Vera. Belvidere, Forest Hall.
1923–27..........	Phillips, John F. V. Knysna.
Feb.–Dec., 1926...	Thode, Justus. Clarkson and neighbourhood.
1905–11, 1920–32, at intervals	Fourcade, H. G. George, Knysna, Humansdorp and Uniondale.

Other Collectors in the Area have been :—

Mund and Maire (1820–21. George and Knysna), Dr. Ludwig Pappe (1861. George, Knysna and Zitzikamma), W. Tyson, Dr. L. Bolus and Mrs. Gillett, Dr. J. Hutchinson and J. B. Gillett (George, Knysna and Humansdorp) and Professor R. H. Compton (George, Knysna, Long Kloof, Kromme River).

Also, in single Divisions :—

George : Dr. Thom (circa 1820), Jules Verreaux (Aug., 1827), F. de Castelnau (July, 1826), Rev. W. Moyle Rogers (1859–61), Lady Barkly, E. W. Young, E. W. Hops, F. Guthrie, Beatrice Hops.

Knysna : Dr. C. L. Leipoldt, Dr. R. Marloth (1898), Buchanan, Williamson, W. C. Worsdell, Miss Michell (Mrs. Levyns).

Humansdorp : Dr. Kitching, P. MacOwan, A. Kennedy (1865), Mrs. G. R. Christie (1909), J. Sim (circa 1920), Dr. E. P. Phillips (1921), Spearman (1922).

Besides others, represented by fewer plants :—

Dr. Gill, J. Burtt-Davy, Ethel West, O. West, Sister Stephany, Van Zyl, R. Burton, F. S. Laughton, Miss E. Stephens.

ABBREVIATIONS AND SYMBOLS.

† Denotes alien species.
G Division of George.
K Division of Knysna.
H Division of Humansdorp.
U Division of Uniondale.
C Recorded from Carroid parts only.
* Within range of the species on the coastal belt.

AREAS.	sq. miles.
George	979
Knysna....................	810
Humansdorp................	1,950
Uniondale..................	1,690
	5,429

GYMNOSPERMAE.

CUPRESSACEAE. Fl. Cap. v, s. ii, Suppl. p. 14.				
Widdringtonia Endl. (l.c. 18)				
1. cupressoides (L.) *Endl.*	G	K	H	U
2. Schwarzii (*Marl.*) *Mast.*	·	·	·	U
1, *Berg Sapree.* 2, *Sapree.*				
CYCADACEAE. Fl. Cap. v, s. ii, Suppl. p. 24.				
Encephalartos Lehm. (l.c. 28)				
1. longifolius (*Jacq.*) *Lehm.*	·	·	H	·
Kaffir bread. Broodboom.				
PODOCARPACEAE. Fl. Cap. v, s. ii, Suppl. p. 3.				
Podocarpus L'Hér. (l.c. 3)				
1. falcatus (*Th.*) *R. Br.*	G	K	H	U
2. latifolius (*Th.*) *R. Br.*	G	K	H	U
1, *Outeniqua Yellowwood, Outeniquas Geelhout.*				
2, *Regte Geelhout, Upright Yellowwood.*				

ANGIOSPERMAE.

Class DICOTYLEDONES.

ACANTHACEAE. Fl. Cap. v, s. i, p. 1.				
Barleria L. (l.c. 44)				
1. irritans *Nees*	·	·	H	·
2. jasminiflora *C. B. Cl.*	·	·	H	·
3. obtusa *Nees*	·	·	H	·
4. pungens *L.f.*	*	K	H	·
Blepharis Juss. (l.c. 22)				
1. capensis (*L.f.*) *Pers.*	*	*	H	·
2. Ecklonii *C. B. Cl.*	*	*	H	·
3. molluginifolia *Pers.*	*	*	H	·
4. procumbens (*L.f.*) *Pers.*	·	·	H	·
sinuata (Nees) C. B. Cl.	*	*	*	·
Chaetacanthus Nees (l.c. 18)				
1. setiger (*Pers.*) *Lindl.*[1]	G	K	H	U
Crabbea Harv. (l.c. 38)				
1. nana *Nees*	·	·	H	·
Dicliptera Juss. (l.c. 90)				
capensis Nees.	*	*	*	·
1. heterostegia (*E. Mey.*) *Presl*	·	·	H	·
2. zeylanica *Nees*	*	K	*	·
Hypoestes R. Br. (l.c. 86)				
1. aristata *R. Br.*	·	K	H	·
2. verticillaris (*L.f.*) *R. Br.*	G	K	H	·

[1] C. Persoonii *Nees.*

Isoglossa Oerst. (l.c. 79)				
1. ciliata (*Nees*) *Lindau*	·	K	*	·
2. Eckloniana (*Nees*) *Lindau*	·	K	*	·
3. sylvatica *C. B. Cl.*	·	K	·	·
Justicia L. (l.c. 55, and under **Monechma** Hochst., l.c. 67)				
1. acuta (*C. B. Cl.*)[1]	·	·	H	·
2. Bowiei *C. B. Cl.*	G	*	*	·
3. cuneata *Vahl*[2]	·	K	*	·
4. orchioides *L.f.*	·	·	H	·
5. rubicunda (*Hochst.*)[3]	·	·	H	·
Peristrophe Nees (l.c. 84)				
1. caulopsila *Presl.*	·	·	H	·
Ruellia L. (l.c. 11)				
pilosa L.f.[4]	*	*	*	·
Siphonoglossa Oerst. (l.c. 74)				
1. tubulosa (*Nees*) *Lindau*	·	K	H	·
Thunbergia L.f. (l.c. 3)				
1. capensis *Retz.*	*	K	H	·
2. Dregeana *Nees*	·	·	H	·
ACHARIACEAE. Fl.Cap. ii, p.498 (under PASSIFLORACEAE)				
Ceratiosicyos Nees				
1. Ecklonii *Nees*	·	K	H	·
AIZOACEAE. Fl. Cap. ii, p. 386 (under MESEMBRYACEAE), and i, p. 120 (under CARYOPHYLLACEAE)				
Aizoon L. (l.c. ii, 469)				
1. glinoides *L.*	·	·	H	·
Galenia L. (l.c. ii, 473)				
1. affinis *Sond.*	·	·	·	U
2. africana *L.*	*	*	*	U
3. papulosa (*E. & Z.*) *Sond.*	·	·	·	U
4. pubescens (*E. & Z.*) *Druce*[5]	·	·	H	U
5. sarcophylla *Fenzl*	·	·	·	U
6. secunda (*Th.*) *Sond.*	·	·	·	U
2, *Kraalbos.*				
Glinus Loeffl. (l.c. i, 136)				
1. lotoides *Loeffl.*	G	·	·	·
Pharnaceum L. (l.c. i, 138)				
arenicola (Sond.) Bol. & Wolley-Dod[6]	*	*	*	·
1. dichotomum *L.f.*	G	K	H	U
var. barbata (*Fenzl*)	G	*	H	U
var. filifolia (*Fenzl*)	·	·	H	·
2. distichum *Th.*	G	K	H	·
3. incanum *L.*	*	*	H	U
lineare L.f.	*	*	*	·

[1] Monechma acutum *C. B. Cl.* [2] M. foliosa *C. B. Cl.* [3] Rhytiglossa rubicunda *Hochst.*
[4] R. Zeyheri (*Sond*) *T. Anders.* [5] G. spathulata *Fenzl.* [6] Hyperstelis arenicola *Sond.*

Tetragonia L. (l.c. ii, 460)				
echinata Ait.	*	*	*	·
1. decumbens *Mill.*	G	K	*	·
2. fruticosa *L.*	*	K	H	U
var. lanceolata (*Sond.*)	·	K	H	·
var. linearis (*Sond.*)	·	K	·	·
3. portulacoides *Fenzl*	*	*	H	·
4. sarcophylla *Fenzl*	·	·	·	U
5. spicata *L.f.*	G	K	*	·
AIZOACEAE, Tribe MESEMBRYEAE, p.p.				
Aptenia N. E. Br.				
1. cordifolia (*L.*) *N. E. Br.*[1]	G	K	H	U
Aridaria N. E. Br.				
1. calycina (*E. & Z.*) *L. Bol.*[2]	*	*	H	·
2. fastigiata (*Haw.*) *Schw.*[3]	·	·	·	U
3. Fourcadei *L. Bol.*	·	·	·	U
4. primulina *L. Bol.*	·	·	H	·
Bergeranthus Schw.				
1. stenophyllus (*L. Bol.*) *Schw.*[4]	·	·	·	U
2. vespertinus *Schw.*	·	·	H	·
Brownanthus Schw.				
1. ciliatus (*Ait.*) *Schw.*[5]	·	·	·	U
Carpobrotus N. E. Br.				
deliciosus L. Bol.	*	*	*	·
1. dulcis *L. Bol.*	·	·	H	·
2. edulis (*L.*) *N. E. Br.*[6]	*	*	H	·
3. Fourcadei *L. Bol.*	·	·	H	·
1, *Goukom.* 2 & 3, *Gouna.*				
Carruanthus Schw.				
1. caninus (*L.*) *Schw.*	·	·	·	U
Cephalophyllum Haw.				
1. procumbens *Haw.*	G	·	·	·
2. diminutum *Haw.*	·	·	·	U
Conicosia N. E. Br.				
1. Bijlii *N. E. Br.*	G	*	H	·
Conophytum N. E. Br.				
1. truncatellum (*Haw.*) *N. E. Br.*[7] ... C	G	·	·	U
2. truncatum (*Th.*) *N. E. Br.*[8] ... C	·	·	·	U
Delosperma N. E. Br.				
1. Ecklonis (*Salm-Dyk*) *L. Bol.*[9]	·	·	H	·
var. glabra	·	·	H	·
2. inconspicuum *L. Bol.*	·	K	·	·
3. litorale *L. Bol.*	G	K	·	·
4. macrorhiza (*Haw.*) *Schw.*[10]	·	·	H	·
5. multiflorum *L. Bol.*	G	K	H	·

[1] M. cordifolium *L.* [2] M. calycinum *E. and Z.* [3] M. fastigiatum *Haw.*
[4] M. stenophyllum *L. Bol.* [5] M ciliatum *Ait.* [6] M. edule *L.* [7] M. truncatellum *Haw.*
[8] M. truncatum *Th.* [9] M. Ecklonis *Salm-Dyk.* [10] M. macrorhizum *Haw.*

6. Patersoniae (*L. Bol.*) *L. Bol.*[1]	·	K	H	·
7. subincanum (*Haw.*) *L. Bol.*	·	·	H	·
8. n. sp. *F.* 4282	·	·	·	U
9. sp. *F* 3635	·	·	H	·
Disphyma N. E. Br.				
1. crassifolium (*L.*) *L. Bol.*[2]	G	K	*	·
Drosanthemum Schw.				
1. albiflorum (*L. Bol.*) *Schw.*[3]	·	·	H	·
2. echinatum (*Ait.*) *L. Bol.*[4]	G	·	H	·
3. Edwardsiae *L. Bol.*	G	·	·	·
4. Fourcadei (*L. Bol.*) *Schw.*[5]	·	·	H	U
5. gracillimum *L. Bol.*	·	·	H	U
6. hispidum (*L.*) *Schw.*[6]	·	·	H	U
7. intermedium (*L. Bol.*) *L. Bol.*[7]	·	·	H	·
8. obliquum (*Haw.*) *Schw.*[8]	·	·	H	·
9. rupestre *N. E. Br. ms.*	·	·	H	·
10. subcompressum (*Haw.*) *Schw.*[9]	·	·	·	U
striatum (Haw.) Schw.[10]	*	*	*	·
11. Vandermerwei *L. Bol.*	G	·	·	·
12. *sp. F.* 4660	·	·	·	U
13. *sp. F.* 4408	·	·	·	U
Faucaria Schw.				
felina (Haw.) Schw.[11]	*	*	*	·
1. uniondalensis *L. Bol.*	·	·	·	U
Gibbaeum Haw.				
1. Helmiae *L. Bol.*	G	·	·	·
Glottiphyllum Haw.				
1. cultratum (*Salm-Dyk*) *N. E. Br.*[12]	·	·	H	·
2. Muirii *N. E. Br.*	G	·	·	·
3. propinquum *N. E. Br.*	G	·	·	·
4. Starkeae *L. Bol.*	·	·	·	U
5. uniondalense *L. Bol.*	·	·	·	U
Hereroa Schw.				
1. gracilis *L. Bol. var.* compressa (*L. Bol.*)	·	·	·	U
granulata Schw.	*	*	*	·
Lampranthus N. E. Br.				
1. curviflorus (*Haw.*) *N. E. Br.*[13]	G	·	·	·
2. dependens (*L. Bol.*) *N. E. Br.*[14]	K	*	H	U
elegans (Jacq.) N. E. Br.	*	*	*	·
glomeratus (L.) N. E. Br.[15]	*	*	*	·
3. multiradiatus (*Jacq.*) *N. E. Br.*[16]	G	*	H	·
4. mutans (*L. Bol.*) *N. E. Br.*[17]	G	*	H	·
5. pauciflorus (*L. Bol.*) *N. E. Br.*[18]	·	K	·	·

[1] M. Patersoniae *L. Bol.*
[2] M. crassifolium *L.*
[3] M. albiflorum *L. Bol.*
[4] M. echinatum *Ait.*
[5] M. Fourcadei *L. Bol.*
[6] M. hispidum *L.*
[7] M. intermedium *L. Bol.*
[8] M. obliquum *Haw.*
[9] M. subcompressum *Haw.*
[10] M. striatum *Haw.*
[11] M. felinum *Haw.*
[12] M. cultratum *Salm-Dyk.*
[13] M. curviflorum *Haw.*
[14] M. dependens *L. Bol.*
[15] M. glomeratum *L.*
[16] M. multiradiatum (*Jacq.*).
[17] M. mutans *L. Bol.*
[18] M. pauciflorum *L. Bol.*

6. productus (*Haw.*) *N. E. Br.*[1]	·	·	H	·
var. purpureum (*L. Bol.*)	·	·	H	·
7. sobrinus *N. E. Br.*) *N. E. Br.*[2]	K	·	·	·
8. subaequalis (*L. Bol.*) *L. Bol.*[3]	G	·	·	U
Leipoldtia L. Bol.				
1. calandra (*L. Bol.*) *L. Bol.*[4]	G	*	H	·
Machairophyllum Schw.				
1. acuminatum *L. Bol.*	·	·	·	U
2. Baxteri *L. Bol.*	G	·	·	·
Malephora N. E. Br.				
lutea (Haw.) Schw.[5]	*	*	*	·
1. mollis (*Ait.*) *N. E. Br.*[6]	G	·	·	U
Mesembryanthemum L. (**Cryophytum** N. E. Br)				
1. Aitonis *Jacq.*	G	K	·	U
2. cryocalyx *L. Bol.*[7]	·	·	H	·
crystallinum L.	*	*	*	·
3. grandiflorum *Haw.*	·	·	·	U
4. nodiflorum *L.*	·	·	·	U
Platythyra N. E. Br.				
1. Haeckeliana (*Berger*) *N. E. Br.*[8]	·	·	H	·
Pleiospilos N. E. Br.				
1. brevisepalus *L. Bol.*	·	·	·	U
2. Kingiae *L. Bol.*	·	·	·	U
3. Leipoldtii *L. Bol.*	·	·	·	U
Psilocaulon N. E. Br.				
1. granulicaule (*Haw.*) *N. E. Br.*[9]	·	·	H	U
2. Lewisiae *L. Bol.*	·	·	·	U
3. Pageae *L. Bol.*	G	·	·	U
4. pubescens (*Haw.*) *N. E. Br.*[10]	G	·	·	U
5. Rogersiae *L. Bol.*	·	·	·	U
6. tenue (*Haw.*) *N. E. Br.*[11]	G	·	·	·
7. utile *L. Bol.*	·	·	·	U
Ruschia Schw.				
1. bellidiflora (*L.*) *L. Bol.*[12]	G	·	·	·
2. congesta (*Haw.*) *L. Bol.*[13]	·	K	·	·
3. cymosa (*L. Bol.*) *Schw.*[14]	G	·	·	·
4. Duthieae *L. Bol.*	·	K	·	·
5. Fourcadei *L. Bol.*	·	·	·	U
6. knysnana *L. Bol.*[15]	K	*	H	·
var. angustifolia (*L. Bol.*)	·	·	H	·
7. lineolata (*Haw.*) *Schw.*[16]	·	·	H	·
8. Maxwellii *L. Bol.*	·	·	·	U
9. spinescens *L. Bol.*	·	·	·	U
10. tenella (*Haw.*) *Schw.*[17]	G	*	H	U
11. virgata (*Haw.*) *Schw.*[18]	·	·	·	U

[1] M. productum *Haw.* [2] M. sobrinum *N. E. Br.* [3] M. subaequale *L. Bol.*
[4] M. calandrum *L. Bol.* [5] M. luteum *Haw.* [6] M. molle *Ait.* [7] Cryophytum intermedium L. *Bol.*
[8] M. Haeckelianum *Berger.* [9] M. granulicaule *Haw.* [10] M. pubescens *Haw.* [11] M. tenue *Haw.*
[12] M. bellidiflorum *L.* [13] M. congestum *Haw.* [14] M. cymosum *L. Bol.* [15] M. knysnanum *L. Bol.*
[16] M. lineolatum *Haw.* [17] M. tenellum *Haw.* [18] M. virgatum *Haw.*

Sceletium N. E. Br.				
1. expansum (*L.*) *L. Bol.*[1]	G	·	·	U
Skiaphytum L. Bol.				
1. Tripolium (*L.*) *L. Bol.*[2]	*	K	·	·
Smicrostigma N. E. Br.				
1. viride (*Haw.*) *N. E. Br.*[3]	G	·	·	·
Trichodiadema Schw.				
1. densum (*Haw.*) *Schw.*[4]	*	*	*	U
2. Fourcadei *L. Bol.*	G	*	H	·
3. stelligerum (*Haw.*) *Schw.*[5]	·	·	H	U
AMARANTACEAE. Fl. Cap. v, s. i., p. 402.				
Achyrantes L.				
1. aspera *L.*	K	*	H	·
Amaranthus L.				
1. hibridus *L.*[6]	·	·	H	U
2. Thunbergii *Moq.*	*	*	H	·
2, *Mistbredie.*				
Pupalia Juss.				
1. atropurpurea (*Lam.*) *Moq.*	·	·	H	·
AMPELIDACEAE. Fl. Cap. i, p. 248.				
Cissus L. (l.c. 249)				
1. cirrhosa (*Th.*) *Pers.*	·	·	H	·
Droog-mij-keel.				
Rhoicissus Planch. (under **Cissus** L., l.c. 249)				
1. capensis (*Burm. f.*) *Planch.*[7]	G	K	H	·
2. cirrhiflora *Gilg & Brandt*[8]	·	K	H	·
var. tridentata (*Harv.*)[9]	·	·	H	·
3. digitata (*L.f.*) *Gilg & Brandt*[10]	·	K	H	·
4. rhomboidea (*E. Mey.*) *Planch.*[11]	·	·	H	·
1. *Bos druif, Wild grape.*				
ANACARDIACEAE. Fl. Cap. i, p. 502.				
Laurophyllus Th. (under **Botryceras** Willd., l.c. 523)				
1. capensis *Th.*[12]	·	K	H	·
Vlak Wit Els (H), *Ystermartiens, Filabossie* (K).				
Loxostylis Spreng. (l.c. 524)				
1. alata *Spreng.*	·	·	H	·
Tierhout.				
Rhus L. (l.c. 504)				
1. crenata *Th.*	*	K	*	·
2. dentata *Th.*	·	·	H	·
3. dissecta *L. f.*	·	·	·	U
4. excisa *Th.*	G	K	H	U

[1] M. expansum *L.* [2] M. Tripolium *L.* [3] M. viride *Haw.* [4] M. densum *Haw.* [5] M. stelligerum *Haw.* [6] A. paniculatus *Cooke and Wright non L.* [7] Cissus capensis *Willd.* [8] Cissus pauciflora *Burch. and* C. cuneifolia *E. and Z.* [9] C. pauciflora *var* tridentata *Harv.* [10] C. Thunbergii *E. and Z.* [11] C. rhomboidea *E. Mey.* [12] Botryceras laurinum *Willd.*

5. fastigiata *E. & Z.*	·	·	H	·
glauca Desf.	*	*	*	·
6. Legati *Schonl.*[1]	G	K	H	·
7. longispina *E. & Z.*	*	K	H	·
8. lucida *L.*	*	K	*	U
9. MacOwani *Schonl.*[2]	G	K	H	U
10. mucronata *Th.*[3]	*	K	H	·
var. latifolia *Schonl.*	·	K	·	·
11. obovata *Sond.*	G	*	H	·
12. outeniquensis *Szyszyl.*	G	K	H	U
13. pyroides *Burch. var.* puberula (*E. & Z.*) *Schonl.*	·	·	H	·
14. refracta *E. & Z.*	·	K	*	·
rosmarinifolia Vahl.	*	*	*	·
15. Schlechteri *Diels*	·	K	H	·
16. scoparia *E. & Z.*	·	K	H	·
17. stenophylla E. & Z.	*	*	H	U
18. tomentosa *L.*	G	K	·	U
var. petiolaris (*Sond.*)	·	·	H	·
19. undulata *Jacq.*	*	K	*	·
1, 8, 10, *Kraaibessie.* 2, *Nana bessie.* 6, *Bos Taaibos.* 18, *Krentebos.* 19, *Guarri. In general, Taaibos.*				
APOCYNACEAE. Fl. Cap. iv, s. i, p. 490.				
Acokanthera G. Don (l.c. 499)				
1. venenata (*Th.*) *G. Don*	G	K	H	·
Gifboom, Boesmanspyl (*K*).				
Carissa L. (l.c. 496)				
1. bispinosa (*L.*) *Desf.*[4]	G	K	H	U
2. haematocarpa *DC.*	·	·	H	·
1, *Numnum.*				
Gonioma E. Mey. (l.c. 515)				
1. Camassi (*Eckl.*) *E. Mey.*	G	K	H	·
Kamassi.				
Pachypodium Lindl. (l.c. 515)				
1. bispinosum (*L.f.*) *DC.*	·	·	H	·
2. succulentum (*Th.*) *DC.*	·	·	H	U
1, *Krachtman.*				
Rauwolfia L.				
1. natalensis *Sond.*	·	·	H	·
Quinine tree.				
Vinca L.				
1. major *L.* †	·	·	H	·
Periwinkle.				

[1] R. laevigata *Th. non L.*
[2] *incl.* R. villosa *L. f. and* R. pubescens *E. and Z.* [3] R. incana *Mill.* [4] C. Arduina *Lam.*

AQUIFOLIACEAE. Fl. Cap. i, p. 472.				
Ilex L. (l.c. 473)				
1. mitis (*L.*) *Radlk.*[1]	G	K	H	U
Without.				
ARALIACEAE. Fl. Cap. ii, p. 568.				
Cussonia Th.				
1. paniculata *E. & Z.*	·	·	·	U
2. spicata *Th.*	·	·	H	U
3. thyrsiflora *Th.*	G	K	H	·
4. umbellifera *Sond.*	·	·	H	·
2, *Nooisboom, Kiepersol, Cabbage Tree.*				
4, *Kiepersol.*				
ASCLEPIADACEAE. Fl. Cap. iv, s. i, p. 518.				
Araujia Brot.				
1. sericifera *Brot.* †	·	K	·	·
Asclepias L. (l.c. 663)				
1. crispa *Berg.*	*	K	H	·
2. Dregeana *Schltr.*	G	K	*	·
3. expansa *Schltr.*	·	K	*	·
4. fruticosa *L.* †	G	K	H	U
navicularis Schltr.	*	*	*	·
5. physocarpa *Schltr.*	·	K	*	·
6. rotundifolia *Mill.*	*	K	*	U
1, *Bitter wortel.* 4, *Gansies, Melkbos.*				
6, *Katoenbos.*				
Astephanus R. Br. (l.c. 547)				
1. marginatus *Decaisne*	·	K	H	·
2. neglectus *Schltr.*	*	K	·	·
Caralluma R. Br (l.c. 872)				
1. chlorantha *Schltr.*	G	·	·	·
Ceropegia L. (l.c. 804)				
1. stapeliaeformis *Haw.*	·	·	H	·
Cynanchum L. (l.c. 743)				
1. acuminatum (*Benth.*) *K. Schum.*	·	·	H	·
2. africanum (*L.*) *R. Br.*	*	K	H	·
3. ellipticum (*Harv.*) *R. A. Dyer*[2]	G	K	H	·
4. natalitium *Schltr.*	·	K	·	·
5. obtusifolium *L.f.*	G	K	H	·
var. pilosum (*Schldl.*)	*	K	*	·
In general, Klimop				
Duvalia Haw.				
1. reclinata *Haw.*	·	·	·	U
Fockea Endl. (l.c. 777)				
edulis (Th.) K. Schum.[3]	*	*	*	·
Glossostephanus E. Mey. (l.c. 740)				
1, linearis (*L.f.*) *E. Mey.*	G	K	H	U

[1] Ilex capensis *Sond. and Harv.* [2] C. capense *Th.* [3] F. glabra *Decaisne.*

Huernia R. Br. (l.c. 902)				
1. brevirostris *N. E. Br.*	·	·	H	·
2. campanulata *R. Br.*	·	·	·	U
3. Eustacei *Pillans ms.*	·	·	H	·
Microloma R. Br. (l.c. 549)				
1. glabratum *E. Mey.*	·	·	·	U
2. tenuifolium (*L.*) *K. Schum.*	*	*	H	U
2, *Red Waxcreeper.*				
Pachycarpus E Mey. (l.c. 714)				
1. dealbatus *E. Mey.*	G	K	H	U
2. grandiflorus (*L.f.*) *E. Mey.*	·	·	H	·
3. vexillaris *E. Mey.*	·	·	H	·
Pectinaria Haw. (l.c. 867)				
1. saxatilis *N. E. Br.*	·	·	·	U
Riocreuxia Decsn. (l.c. 799)				
1. torulosa (*E. Mey.*) *Decsne.*	G	K	H	·
Sarcostemma R. Br. (l.c. 755)				
1. viminale (*L.*) *R. Br.*	*	K	*	U
Schizoglossum E Mey. (l.c. 588)				
1. consimile *N. E. Br.*	·	·	H	·
2. cordifolium *E. Mey.*	G	K	H	U
3. filiforme (*L.*) *Druce*[1]	*	K	*	U
4. heterophyllum *Schltr.*[2]	G	K	H	U
5. tenellum (Turcz.) *Druce*[3]	*	*	H	·
6. tomentosum *Schltr.*	·	·	H	U
Secamone R. Br. (l.c. 542)				
1. Alpini *Schultes*	G	K	H	·
Melktou, Monkey rope.				
Stapelia L. (l.c. 924)				
1. Asterias *Masson*	G	·	·	U
2. Bijlii *Pillans*	G	·	·	·
3. Desmetiana *N. E Br.*	·	·	·	U
4. flavirostris *N. E. Br.*	G	·	·	·
5. fusco-purpurea *N. E. Br.*	·	·	H	·
6. gemmiflora *Masson*	·	·	H	U
7. pulchella *Masson*	·	·	H	·
8. variegata *L.*	G	*	H	·
9. verrucosa *Masson*	·	·	·	U
Trichocaulon N. E. Br. (l.c. 888)				
1. piliferum *N. E. Br.*	G	·	·	·
Tylophora R. Br. (l.c. 764)				
1. cordata (*Th.*) *Druce*[4]	G	K	*	·
Woodia *Schltr.* (l.c. 560)				
1. mucronata *N. E. Br.*	·	·	H	·
Xysmalobium R. Br. (l.c. 564)				
1. involucratum (*E .Mey.*) *Decsne.*	·	·	·	U
2. undulatum (*L.*) *R. Br.*	G	*	*	U

[1] S. linifolium *Schltr.* [2] *incl.* S. villosum *Schltr.* [3] S. Aschersonianum *Schltr.*
[4] T. syringaefolia *E. Mey.*

BASELLACEAE.				
Boussingaultia HBK.				
1. baselloides *HBK.* ....†	·	K	·	·
BALSAMINACEAE. Fl. Cap. i, p. 312.				
Impatiens L.				
1. Duthieae *L. Bol.*[6]	G	K	H	·
Wild balsam.				
BIGNONIACEAE. Fl. Cap. iv, s. 2, p. 447.				
Rhigozum Burch. (l.c. 450)				
1. obovatum *Burch.*	·	·	H	·
2. trichotomum *Burch.*	·	·	·	U
Driedoorn.				
Tecomaria Spach (l.c. 448)				
1. capensis (*Th.*) *Spach* ....†	·	·	H	·
Kaffir honeysuckle.				
BORAGINACEAE. Fl. Cap. iv, s. 2, p. 2				
Anchusa L. (l.c. 16)				
1. riparia *DC.*	·	·	H	U
Ystergras.				
Cynoglossum L. (l.c. 13)				
1. hispidum *Th.*	*	K	*	U
2. micranthum *Desf.*	·	K	H	·
Echium L. (l.c. 43)				
1. violaceum *L.* ....†	*	*	H	·
Ehretia L. (l.c. 4)				
1. rigida (*Th.*) *Druce*[1]	·	·	H	·
Heliotropium L. (l.c. 7)				
supinum L.	*	*	*	·
Lappula Moench (under **Echinospermum** Swartz, l.c .15)				
1. cynoglossoides (*Lam.*)[2] ....†	·	·	·	U
Lithospermum L. (l.c. 20)				
1. arvense *L.* ....†	*	*	H	·
2. officinale *L.* ....†	·	K	*	·
3. papillosum *Th.*	G	*	*	·
4. scabrum *Th.*	·	K	H	·
Lobostemon Lehm. (l.c. 25)				
1. argenteus *Buek.*[3]	*	*	H	U
2. echioides *Lehm.*[4]	G	·	·	U
3. fruticosus (*L.*) *Buek.*	G	*	H	U
4. stachydeus *DC.*	G	·	·	U
5. strigosus *Buek.*	·	·	H	·
6. trigonus (*Th.*) *Buek*[5]	*	K	H	U
3, *Ag-dag-genees bos.*				

[1] E. hottentotta *Burch.* [2] Echinospernum cynoglossoides *Lam.* [3] *incl.* L. montanus *Buek.* [4] *incl.* L. diversifolius *Buek.*, L. fastigiatus *Buek*, L. microphyllus *Buek.*
[5] *incl.* L. obtusifolius *DC and* L. scaber *DC.* [6] I. capensis Th. (1794) non Meerburgh (1775).

Myosotis L. (l.c. 18)					
1. afropalustris *C. H. Wright*		·	K	·	·
2. intermedia *Link*		G	*	H	·
3. sylvatica *Hoffm.*		·	K	H	·
Forget-me-nots.					
BRUNIACEAE. Fl. Cap. ii, p. 309					
Berzelia Brongn. (l.c. 310)					
1. abrotanoides (*L.*) *Brongn.*		G	·	·	·
2. comosa *E. & Z.*[1]		·	K	H	U
3. intermedia *Schltdl.*		G	K	H	U
4. lanuginosa (*L.*) *Brongn.*		G	K	H	·
var. glabra (*Sond.*)		·	K	H	·
4. *Kolkol.*					
Brunia L. (l.c. 313)					
1. macrocephala *Willd*		·	K	·	·
2. nodiflora *L.*		*	K	H	U
1, *Vaal stompie.* 2, *Stompie.*					
Linconia L. (l.c. 317)					
1. alopecuroides *L.*		*	*	H	·
Nebelia Neck. (under **Berardia** Brongn., l.c. 318)					
1. paleacea (*Berg.*) *Sw.*[2]		G	·	·	·
Pseudobaeckea Niedenzu (under **Brunia** L., l.c. 313)					
1. racemosa (*Th.*) *Nied.*[3]		G	K	H	U
CACTACEAE.					
Opuntia Mill.					
1. aurantiaca *Lindl.*	† C	·	·	H	·
2. streptocantha *Lemaire*?	† C	·	·	H	U
1, *Jointed Cactus.* 2, *Prickly Pear.*					
CAMPANULACEAE. Fl. Cap. iii, p. 50.					
Cyphia Berg. (l.c. 597)					
1. dentariaefolia *Presl.*		G	·	·	·
2. digitata *Willd.*		G	K	·	·
3. heterophylla *Presl*		G	K	*	·
linarioides Presl		*	*	*	·
4. sylvatica *Eckl.*		G	K	*	U
5. undulata *Eckl.*		·	·	H	·
In general, Barroe. 4, *Bos barroe.*					
Grammatotheca Presl (l.c. 532)					
1. erinoides *Sond.*		*	K	H	·
Laurentia Mich. (l.c. 552)					
1. arabidea (*Presl*) *A.DC.*		*	K	H	·
2. hederacea *Sond.*		·	K	*	·
3. longiflora *Schltr.*		G	·	·	·
Lightfootia L'Hér. (l.c. 554)					
1. axillaris *Sond.*		·	·	·	U

[1] B. commutata *Sond.* [2] Berardia palacea *Brongn.* [3] Brunia racemosa *Sond.*

2. ciliata (*Th.*) *Sond.*	G	K	H	U
var. debilis (*Sond.*)	·	·	H	·
3. cinerea (*L.*) *Sond.*	·	K	H	U
4. denticulata (*Burch.*) *Sond.*	·	·	H	U
5. fasciculata (*L.*) *A.DC.*	·	K	·	·
6. grisea *Buek.*	G	*	H	U
7. rubens *Buek.*	*	*	H	·
8. rubioides *A.DC.*	·	·	H	·
9. tenella (*L.*) *A.DC.*	·	·	H	U
10. unidentata (*Th.*) *A.DC.*	G	K	H	U
Lobelia L. (l.c. 537, incl. **Mezleria** Presl, l.c. 532, **Parastranthus** G. Don, l.c. 536, **Dobrowskya,** l.c. 549)..				
1. ardisandroides *Schltr.*	G	·	·	·
2. anceps *Th.*[1]	*	K	H	·
var. minor (*Sond.*)	·	·	H	·
3. aspera *Spreng.*[2]	G	K	H	U
4. coronipifolia *L.*	G	K	H	·
depressa L.[3]	*	*	*	·
5. dichroma *Schltr.*	G	·	·	·
6. Erinus *L. var.* Erinus (*Harv.*)	G	*	H	U
var. bellidifolia (*Harv.*)	G	*	H	·
var. microdon (*Harv.*)	*	*	H	U
erinoides Th.	*	*	*	·
7. fervens *Th.*	–	K	·	·
filicaulis Presl[4]	*	*	*	·
8. hederacea *A.DC.*	G	·	·	·
9. hirsuta *L.*	G	K	H	U
10. linarioides (*Presl*) *A.DC.*	·	K	H	U
11. linearis *Th.*	·	·	·	U
12. lutea *L.*[5]	*	*	H	·
13. patula *L.f.*	G	·	·	U
14. pubescens *Ait.*	·	K	H	·
var. incisa (*Sond.*)	·	·	H	·
var. Jacquiniana (*Sond.*)	·	·	H	·
var. Thunbergiana (*Sond.*)	G	*	H	·
15. scabra *Th.*[6]	G	K	H	U
16. spartioides (*Presl*) *A.DC.*	G	·	·	U
17. sylvatica *Fourc.*	G	·	·	·
18. tenella *Th.*[7]	G	K	H	U
19. thermalis *Th.*[8]	·	·	H	U
20. tomentosa *L.*	G	K	H	·
var. paucidentata (*Sond.*)	·	·	·	U
Microcodon A.DC.				
1. glomeratum *A.DC.*	·	K	·	·

(1) *incl.* L. knysnaensis *Schltr.*

(2) Dobrowskya aspera *A. DC.*

(3) Mezleria depressa *Sond.*

(4) Mezleria filicaulis *Presl.*

(5) Parastranthus luteus *A. DC.*

(6) Dobrowskya scabra *A. DC.*

(7) Dobrowskya tenella *Sond.*

(8) Parastranthus thermalis *Sond.*

Prismatocarpus L'Hér. (l.c. 585)				
1. Candolleanus *Ch. & Schltdl.*	G	·	·	·
2. Rogersii *Fourc.*	G	·	·	·
3. strictus *A.DC.*[1]	G	*	H	·
4. virgatus *Fourc.*	·	·	·	U
Roella L. (l.c. 591)				
1. Eckloniana *Buek.*	·	·	H	U
spicata L.	*	*	*	·
Theilera Phillips				
1. Guthriei (*L Bol.*) *Phillips*)[2]	G	K	·	U
Wahlenbergia Schrad. (l.c. 566)				
1. arenaria *A.DC.*	*	*	H	·
2. capillacea (*Th.*) *A.DC.*	·	K	H	U
3. capillifolia *E. Mey.*	·	·	H	·
4. Ecklonii *Buek.*	·	·	·	U
5. obovata *v. Brehmer*[3]	*	K	H	·
6. polychotoma *v. Brehmer*	·	K	·	·
7. procumbens (*Th.*) *A.DC.*	*	K	H	U
8. stellarioides *Ch. & Schl.*	·	·	H	·
9. undulata (*L.f.*) *A.DC.*	G	K	H	U
CAPPARIDACEAE. Fl. Cap. i, p. 54.				
Cadaba Forsk (under **Schepperia** Neck., l.c. 59)				
1. juncea (*Sparm.*) *Harv.*[4]	·	·	H	·
Capparis L. (l.c. 61)				
1. citrifolia *Lam.*	·	·	H	·
var. sylvatica (*Harv.*)	·	K	H	·
Cape capers, Wilde lemoen.				
Maerua Forsk. (under **Boscia** Lam., l.c. 60 and **Niebuhria** DC. l.c. 60)				
1. racemulosa (*DC*) *Gilg. & Ben.*	G	K	·	·
2. triphylla (*Th.*) *Dur. & Schinz*[5]	·	K	H	·
CARYOPHYLLACEAE. Fl. Cap. i, p. 120.				
Cerastium L. (l.c. 130)				
1. capense *Sond.*	*	K	H	·
2. glomeratum *Thuill.*[6] †	*	*	H	·
Corrigiola L. (l.c. 132, and v, s. i., p. 400)				
litoralis L. †	*	*	*	·
Dianthus L. (l.c. 122)				
1. Bolusii *Burtt-Davy*	G	*	H	·
2. caespitosus *Th.*	·	·	·	U
3. crenatus *Th.*	G	*	*	·
4. micropetalus *E. Mey.*[7]	·	K	*	U
5. incurvus *Th.*	*	*	*	U
6. prostratus *Jacq.*	G	*	*	·
In general, Wilde angelier, Wild pink.				

[1] P. campanuloides *Sond.* [2] Wahlenbergia Guthriei *L. Bol.* [3] W. cernua *Sond. non DC.* [4] Schepperia juncea *A.DC.* [5] Niebuhria triphylla *Wendl.*, Boscia caffra *Sond.* [6] C. viscosum *L.* [7] D. scaber *Th.*

Drymaria Willd. (l.c. 135)				
1. cordata (*L.*) *Willd.*	G	·	·	·
Herniaria L. (l.c. 132, and v, s. i, 400)				
hirsuta L. †	*	*	*	·
Pollichia Soland. (l.c. v, s. i, 399)				
1. campestris *Soland.*	·	·	H	U
Polycarpon Loeffl. (l.c. 133)				
1. tetraphyllum *L.f.* †	G	*	H	U
Scleranthus L. (l.c. v, s. i, 401)				
annuus L. †	*	*	*	·
Silene L. (l.c. 125)				
1. bellidioides *Sond.*	·	K	H	·
2. Burchellii *Otth*	*	K	H	U
var. angustifolia (*Harv.*)	·	·	H	·
3. capensis *Otth*	G	K	*	U
clandestina Jacq.	*	*	*	·
4. gallica *L.*	G	K	H	·
var. quinquevulnera (*Koch*)	·	·	H	·
5. Mundiana *E. & Z.*	·	K	·	·
6. primulaeflora *E. & Z.*	·	K	H	·
7. Thunbergiana *E. & Z.*	G	·	·	·
Spergula L. (l.c. 135)				
1. arvensis *L.*	*	K	H	·
Spergularia J. & C. Presl (under **Lepigonum** Fries, l.c. 134)				
1. media *Presl.*[1] †	·	K	H	·
2. rubra (*L.*) *Presl*[2] †	*	K	*	·
3. salina *J. & C. Presl*[3] †	*	K	H	·
Stellaria L. (l.c. 130)				
1. media (*L.*) *Vill.* † *Chickweed.*	*	*	H	·
CELASTRACEAE. Fl. Cap. i, p. 451				
Cassine L. (l.c. 465, and under **Elaeodendron** Jacq., l.c. 467, **Mystroxylon** E. & Z., l.c. 469)				
1. aethiopica *Th.*[4]	·	K	H	·
2. crocea (*Th.*) *O. Kze.*[5]	G	K	H	·
3. eucleaeformis (*Sond.*) *O. Kze.*[6]	·	K	H	·
4. Kraussiana *Bernh.*[7]	G	K	H	·
5. latifolia *E. & Z.*	*	K	H	·
6. maritima (*Bol.*) *L. Bol.*	*	K	H	·
7. papillosa (*Hochst.*) *O. Kze.*[8]	G	K	H	·
8. parvifolia *Sond.*	*	*	H	·
9. sphaerophylla (*E. & Z.*) *O. Kze.*[9]	*	K	H	·
10. tetragona (*Th.*) *Loesn.*[10]	·	K	H	·

[1] Lepigonum marginatum *Koch.* [2] Lepigonum rubrum. *Fries.*
[3] Lepigonum medium *Fries.* [4] Mystroxylon confertiflorum *Tulasne.*
[5] Elaeodendron croceum *DC. and* C. papillosa *Davison p. pte.*
[6] Mystroxylon eucleaeforme *Sond.* [7] Cassine capensis *Sond. p. pte.*
[8] Elaeodendron capense *E. and Z.* [9] Mystroxylon sphaerophyllum *E. and Z.*
[10] C. scandens *E. and Z.*

11. velutina (*Harv.*) *Loesn.*[1]	·	K	H	·
1, *Kubu.* 2, *Saffraan.* 3, *Wit Sybas.* 4, *Lepelhout, Red Pear.* 7, *Bastard Saffraan.* 9, *See Saffraan.*				
Catha Forsk. (under **Methyscophyllum** E. & Z., l.c. 463)				
1. edulis *Forsk.*[2]	·	K	·	·
Gymnosporia Wight & Arn. (under **Celastrus** L., l.c. 463, and **Scytophyllum**, E. & Z., l.c. 471)				
1. acuminata (*L.*) *Szyszy.*[3]	G	K	H	U
var. microphylla (*Davison*)	·	·	·	U
2. buxifolia (*L.*) *Szyszy.*[4]	*	K	H	·
var. glomeruliflora (*Davison*)	·	·	H	·
3. crataegiflora *Davison*	·	K	·	·
4. elliptica (*Th.*) *Davison*[5]	*	*	H	·
5. heterophylla (*E. & Z.*) *Loesn.*[6]	–	–	H	–
integrifolia (L.f.) Glover[7]	*	*	*	·
6. laurina (*Th.*) *Bol. & Wolley-Dod*[8]	G	·	·	U
7. nemorosa (*E. & Z.*) *Szyszy.*[9]	·	K	H	·
8. penduncularis (*Sond.*) *L. Bol.*[10]	·	K	H	·
9. procumbens (*L.f.*) *Loesn.*[11]	*	K	H	·
1, *Rooi Sybas.* 2, *Pendoring.* 8, *Swarthout.*				
Hartogia L.f. (l.c. 464)				
1. capensis *Th.*	*	K	H	·
Lauridia E. & Z.				
1. reticulata *E. & Z.*	G	*	H	·
Pterocelastrus Meisn. (l.c. 461)				
1. rostratus (*Th.*) *Walp.*	G	·	·	·
2. tricuspidatus (*Lam.*) *Sond.*[12]	G	K	H	U
2, *Kershout.*				
Putterlickia Endl. (under **Celastrus** L., l.c. 452)				
1. pyracantha (*L.*) *Endl.*[10]	*	K	H	·
CERATOPHYLLACEAE. Fl. Cap. v, s. ii, p. 580.				
Ceratophyllum L. (l.c. 580)				
1. demersum *L.* †	G	*	H	·
CHENOPODIACEAE. Fl. Cap. v, s. i, p. 433.				
Anredera Juss.				
1. spicata *Pers.* †	·	K	·	·
Arthrocnemum Moq. (under **Salicornia** L., l.c. 448)				
1. africanum *Moss ms.*[14]	*	K	*	·
2. fruticosum (*L.*) *Moq.*[15]	*	K	*	·
3. heptiflorum *Moss*[16]	G	*	H	·

[1] Elaeodendron velutinum *Harv.* [2] Methyscophyllum glaucum *E. and Z.*
[3] Celastrus acuminatus *L.* [4] Celastrus buxifolius *L.* [5] Celastrus ellipticus *Th.*
[6] Celastrus heterophyllus *E. and Z. p. pte.* [7] Celastrus integrifolius *L. f.*
[8] Scytophyllum laurinum *E. and Z.* [9] Celastrus nemorosus *E. and Z.*
[10] Celastrus peduncularis *E. Mey.* [11] Celastrus procumbens *L. f.* [12] *incl.* P. variabilis *Sond.*
[13] Celastrus pyracanthus *L.* [14] Salicornia natalensis *C. H. Wright non Bunge.*
[15] Salicornia fruticosa *L.* [16] Salicornia pachystachya *Black non Bunge ex Ung. St.*

4. perenne (*Mill.*) *var.* radicans (*Smith*) *Moss*[1]	G	K	·	·
5. *sp.* (A. Pillansii *Moss ms.*)	G	K	·	·
2, *Zeekraal.*				
Atriplex L. (l.c. 442)				
1. capensis *Moq.*[2]	*	*	H	U
2. laciniata *L.* †	·	K	H	·
3. rosea *L.* †	·	·	H	U
Saltbushes.				
Chenolea Th. (l.c. 447)				
1. diffusa *Th.*	*	K	H	·
Chenopodium L. (l.c. 435)				
1. album *L.* †	*	K	H	·
2. ambrosioides *L.* †	*	*	H	·
3. murale *L.* †	*	*	H	U
Exomis Fenzl (l.c. 441)				
1. albicans (*Ait.*) *Moq.*[3]	·	·	·	U
2. axyrioides *Fenzl*	*	K	*	·
Roubieva Moq. (l.c. 440)				
multifida (Crantz) Moq.	*	*	*	·
Salicornia L. (l.c. 448)				
1. *sp. Duthie* 884, 884*a*, 982 (S. Meyeriana *Moss ms.*)	G	*	K	·
Salsola L. (l.c. 451)				
1. aphylla *L.f.*	·	·	·	U
2. glabrescens *Burtt-Davy*	·	·	·	U
3. Kali *L. var.* glabra (*Forsk.*) †	G	·	·	·
1. *Brakganna.* 3, *Russian thistle, Saltwort.*				
Suaeda Forsk. (l.c. 450)				
caespitosa Wolley-Dod	*	*	*	·
1. fruticosa (*L.*) *Forsk.* †	·	·	·	U
COMPOSITAE. Fl. Cap. iii, p. 44.				
Amellus L. (l.c. 61)				
1. scabridus *DC.*	·	·	·	U
2. strigosus (*Th.*) *Less.*	*	*	H	U
Anaglypha DC (l.c. 68)				
1. acicularis *Benth.*	·	K	·	·
Anthemis L.				
1. Cotula *L.* †	·	K	·	·
Stinking chamomile.				
Arctotis L. (l.c. 448, incl. **Microstephium** Less., l.c. 468)				
1. acaulis *L.*	G	*	*	U
2. angustifolia *L.*	·	·	H	·
3. argentea *Th.*	·	·	H	·
4. petiolata *Th.*	G	*	H	·
5. populifolia *Berg.*[4]	*	K	H	·
6. speciosa (*Jacq.*) *sub. sp.* Hayana *Stapf & C. A. Smith*	G	·	·	U
stoechadifolia Berg.	*	*	*	·
7. virgata *Jacq.*	·	·	·	U
1, *Gousblom.*				

[1] Salicornia herbacea *L.* [2] A. Halimus *C. H. Wr. non L.* [3] Atriplex albicans *Ait.*
[4] Microstephium niveum *Less.*

Arctotheca Wendl.				
1. repens *Wendl.*	·	·	H	·
Artemisia L. (l.c. 169)				
1. Afra *Jacq.*	G	K	H	·
Wilde als.				
Aster L. (l.c. 169, incl. **Diplopappus** DC, l.c. 84 and **Mairia** Nees p.p., l.c. 64)				
1. adfinis (*Nees*) *Less.*	G	K	·	U
2. aethiopicus *Burm.*	G	K	*	·
3. Bakerianus *Burtt-Davy.*[1]	·	K	H	U
4. barbatus (*DC*) *Harv.*	·	·	H	U
5. capensis *Less.*	*	K	H	U
var. rotundifolia (*Harv.*)	·	·	H	·
6. caffrorum (*Nees*) *Less.*	·	·	H	·
7. corymbosus (*Harv.*)[2]	G	·	·	·
8. echinatus (*Th.*) *Less.*	·	·	·	·
var. echinata (*Harv.*)	·	K	*	·
var Paralia (*Harv.*)	·	·	H	·
9. elongatus *Th.*	·	·	·	·
var. crassifolius (*Harv.*)	·	·	H	U
var. Thunbergii (*Harv.*)	G	K	·	·
10. erigeroides (*DC*) *Harv.*	·	K	H	·
11. exilis *Ellm.* †	·	·	H	·
12. ficoideus (*DC*) *Harv.*	·	K	*	·
13. filifolius *Vent.*[3]	*	*	H	U
14. hirtus *Th.*[4]	·	·	H	U
15. hyssopifolius *Berg.*	*	*	*	U
16. muricatus *Less.*	G	·	·	·
var. fascicularis *E. Mey.*	·	·	H	U
17. outeniquae *Fourc.*	·	·	H	·
18. Schlechteri *Compton*[5]	·	·	·	U
19. serratus *Th.*	·	K	·	·
serrulatus Harv.	*	*	*	·
strigosus Licht.	*	*	*	·
20. subulatus *Michx.* †	·	·	H	·
21. venustus *Fourc.*	G	·	·	·
22. Westiae *Fourc.*	·	·	H	·
18, *Draaibossie.*				
Athanasia L. (l.c. 187)				
capitata L.	*	*	*	·
1. dentata *L.*	G	K	H	·
2. dimorpha *DC.*	G	K	*	–
3. filiformis *L.f.*	·	·	·	·
var. cinerea (*Harv.*)	G	*	*	U
var. glabra (*Harv.*)	G	*	*	U
4. flexuosa *Th.*	·	·	·	U
5. linifolia *Harv.*	·	·	·	U

[1] Diplopappus asper *Less.* [2] Mairea corymbosa *Harv.* [3] Diplopappus filifolius *DC.*
[4] A. hyssopifolius *var* hirtus *Harv.* [5] Diplopappus elongatus *DC.*

6. pectinata *L.f.*	·	·	·	U
7. pinnata *L.f.*	·	·	·	U
8. punctata (*DC*) *Harv.*	*	*	H	U
9. tomentosa *Th.*	·	·	·	U
10. trifurcata *L.*	G	K	H	U
11. vestita (*Th.*) *Druce*[1]	G	*	*	U
Athrixia Ker (l.c. 291)				
1. crinita (*Th.*) *Druce*[2]	*	K	·	U
2. heterophylla (*Th.*) *Less.*	G	K	H	U
Berkheya Ehrh. (l.c. 501, incl. **Stobaea** Th. l.c. 486, and **Stephanocoma** Less. l.c. 485)				
1. armata (*Th.*) *Druce*[3]	·	·	·	U
2. atractyloides (*Th.*) *Bol. & Wolley-Dod.*[4]	·	·	·	U
3. carduoides (*Less.*) *Hutch.*[5]	·	K	H	U
4. cruciata *Willd.*[6]	·	·	·	U
decurrens (Th.) Hutch. & Burtt-Davy[7]	*	*	*	·
5. echinopoda (*DC.*)[8]	·	·	H	·
6. Ecklonis *Harv.*	G	·	·	·
7. glabrata *Th.*[9]	G	*	H	U
8. heterophylla (*Th.*) *O. Hoffm.*[10]	G	K	H	U
9. onobromoides (*DC.*)[11]	·	·	·	U
10. petiolata (*DC.*) *Schonl.*[12]	·	·	H	·
11. revoluta (*Vahl*) *Druce*[13]	*	*	H	·
12. stobaeoides *Harv.*	*	*	*	U
4, *Disseldoorn.*				
Bidens L. (l.c. 133)				
1. pilosa *L.* †	G	*	H	·
Blackjack.				
Brachylaena R. Br. (l.c. 115)				
1. glabra (*L.f.*) *Druce*[14]	*	K	H	·
2. neriifolia (*L.*) *R. Br.*	G	K	H	·
1, *Malbar.* 2, *Water witels.*				
Carduus L.				
1. tenuiflorus *Curtis* †	G	·	·	·
Thistle.				
Cenia Comm. (l.c. 184)				
1. pectinata *DC.*	·	·	H	·
2. turbinata (*L.*) *Pers.*	*	K	H	·
2, *Gansekos.*				
Centaurea L. (l.c. 609)				
calcitrapa L. †	*	*	*	·
1. melitensis *L.* †	·	·	H	U
1, *Maltese thistle.*				
Chrysanthemum L. (l.c. 161)				
1. segetum *L.* †	·	·	·	U
Corn marigold.				

[1] A. fasciculata *D. Dietr.* [2] A. capensis *Ker.* [3] B. carthamoides *Willd.* [4] Stobaea atractyloides *Th.* [5] Stephanocoma carduoides *Less.* [6] Stobaea cruciata *Harv.* [7] Stobaea scolymoides *DC.* [8] Stobaea echinopoda *DC.* [9] Stobaea glabrata *Th.* [10] Stobaea heterophylla *Th.* [11] Stobaea onobromoides *DC.* [12] Stobaea petiolata *DC.* [13] B. lanceolata *Willd.* [14] B. dentata *Less.*

Chrysocoma Cass. (l.c. 93)				
1. tenuifolia *Berg.*	G	K	H	U
var. microcephala (*Harv.*)	·	·	·	U
Bitter bossie.				
Cineraria L. (l.c. 307)				
1. alchemilloides *DC.*	·	·	·	U
2. aspera *Th.*	·	·	·	U
3. geifolia *L.*	G	*	H	·
4. geraniifolia *DC.*	·	·	·	U
5. lobata *L'Hér.*	·	K	H	U
6. mitellaefolia *L'Hér.*[1]	·	·	·	U
7. platycarpa *DC.*	·	·	·	U
Conyza Less. (l.c. 111)				
1. ivaefolia (*L.*) *Less.*	*	K	H	U
2. obscura *DC.*	·	·	·	U
3. pinnata (*L.f.*) *O. Kze.*[2]	*	K	H	·
pinnatifida (Th.) *DC.*	*	*	*	·
4. ulmifolia (*Burm. f.*) *O. Kze.*[3]	*	*	H	U
Corymbium L. (l.c. 55)				
1. africanum *L.*[4]	*	K	H	U
2. Fourcadei *Hutch.*	·	·	·	U
3. latifolium *Harv.*	G	K	*	·
Cotula L. (l.c. 177)				
1. ceniaefolia *DC.*	*	K	*	U
2. coronopifolia *L.*	G	K	*	·
3. heterocarpa *DC.*	·	·	·	U
4. microcephala *DC.*	·	·	H	·
5. tenella *E. Mey.*	G	·	·	·
6. villosa *DC.*	–	–	–	U
Cryptostemma R. Br. (l.c. 467)				
1. calendulaceum (*Jacq.*) *R. Br.*	G	K	H	·
Gousblom.				
Cullumia R. Br.				
1. bisulca (*Th.*) *Less.*	·	·	·	U
2. cirsioides *DC.*	G	*	H	·
3. decurrens *Less.*	G	K	H	U
4. hispida (*Th.*) *Less.*	G	*	*	·
5. patula (*Th.*) *Less.*	G	·	·	U
6. setosa *R. Br.*	·	·	·	U
7. squarrosa (*Berg.*) *R. Br.*	*	K	·	·
Denekia Thunb. (l.c. 118)				
1. capensis *Th.*	·	·	·	U
Dichrocephala DC. (l.c. 114)				
1. integrifolia (*L.f.*) *O. Kze.*[5]	G	K	H	·
Dicoma Cass. (l.c. 515)				
1. picta (*Th.*) *Druce*[6]	*	*	*	U
2. spinosa (*Th.*) *Druce*[7]	G	*	*	U

[1] Senecio cordifolius *L.f.* [2] C. pinnatilobata *DC.* [3] C. incisa *Ait.*
[4] C. scabrum *L.f.* and C. nervosum *Th.* [5] D. latifolia *DC.* [6] D. radiata *Less.*
[7] D. Burmanni *Less.* and D. diacanthoides *Less.*

Dimorphotheca Moench (l.c. 417)				
1. Ecklonis *DC.*	·	·	H	·
2. fruticosa (*L.*) *Less.*	*	K	H	·
3. nudicaulis *DC.*	G	K	·	U
4. pinnata (*Th.*) *Harv.*	G	·	·	·
5. pluvialis (*L.*) *Moench*[1]	*	*	H	·
6. viscosa (*Andr.*) *Druce*[2] C	·	·	·	U
1, *Jackalsbos.* 3, *Wit Margriet.* 5, *Boterblom.*				
Disparago Gaertn. (l.c. 277)				
1. ericoides *Gaertn.*	·	K	H	U
2. Kraussii *Sch. Bip.*	G	K	H	·
3. rosea *Hutch.*	·	·	·	U
Elytropappus Cass. (l.c. 273)				
1. adpressus *Harv.*	G	·	·	·
2. cernuus (*Th.*)[3]	G	·	H	U
3. gnaphaloides (*L.*) *Levyns*[4]	·	·	·	U
rhinocerotis (L.f.) Less.	*	*	*	·
In general, Rhenoster.				
Erigeron L. (l.c. 86)				
1. canadense *L.* †	*	*	H	·
2. linifolium *Willd.* †	·	·	H	·
1, *Horseweed.*				
Eriocephalus L. (l.c. 199)				
1. capitellatus *DC.*	*	*	H	·
2. ericoides (*L.f.*) *Druce*[5]	·	·	·	U
3. punctulatus *DC.*	·	·	H	·
4. racemosus *L.*	*	K	·	U
5. sericeus *Gaudich.*	·	·	H	·
6. tenuipes *C. A. Smith*	·	·	H	U
7. umbellulatus *DC.*	*	K	*	·
7, *Kapokbossie.*				
Euryops Cass. (l.c. 408)				
1. algoensis *DC.*	·	·	H	·
2. abrotanifolius *DC.*	G	K	*	·
3. lateriflorus (*L.f.*) *Less.*	G	·	·	·
4. longipes *DC.*	G	·	·	·
5. spathaceus *DC.*	·	·	H	·
6. tenuissimus (*L.f.*) *Less.*	*	*	H	U
7. trilobus *Harv.*	·	·	H	·
8. virgineus (*L.f.*) *Less.*	·	K	H	·
3, 6, *Harpuisbos.*				
Galinsoga Ruiz & Pavon				
1. parviflora *Cav.* †	·	·	H	·
Gamolepis Less. (l.c. 155)				
1. euryopoides *DC.*	·	·	H	·
2. munita (*L.f.*) *Less.*	*	*	H	U

[1] D. annua *Less.* [2] D. cuneata *Less.*
[3] Incl. in E. rhinocerotis in Fl. Cap and in Mrs. Levyns' revision. Stoebe cernua *Th.*
[4] Incl. E. glandulosus *Less. var* ambiguus (*Harv.*) and E. canescens *DC.*
[5] E. glaber *Th.*

		G	K	H	U
3. pectinata *Less.*		G	K	H	U
4. pinnatipartita (*DC.*) *Less.*		·	·	H	U
3, *Berg Kamile.*				·	
Garuleum Cass. (l.c. 92)					
1. bipinnatum (*Th.*) *Less.*	C	·	·	·	U
Gazania Gaertn. (l.c. 471)					
1. Kraussii *Sch. Bip.*		·	·	H	·
2. leucolaena *DC.*		·	·	H	·
3. linearis (*Th.*) *Druce*[1]		·	·	H	U
4. longiscapa *DC.*		·	K	H	·
5. oxyloba *DC.*		G	K	H	U
6. Pavonia *R. Br.*		·	·	·	U
7. pinnata (*Th.*) *Less.*		*	K	H	U
8. uniflora (*L.f.*) *Sims.*		G	K	H	·
6, *Gousblom.* 7, *Boterblom.*					
Gerbera Gron. (l.c. 519)					
1. cordata (*Th.*) *Less.*		G	K	H	·
2. Lynchii *Dummer*		·	·	H	·
3. piloselloides (*L.*) *Cass.*		*	K	H	U
4. serrata (*Th.*) *Druce*[2]		G	K	·	·
5. tomentosa *DC.*		*	*	H	U
Gnaphalium L. (l.c. 260)					
1. candissimum *Lam.*		*	*	H	·
2. luteo-album *L.*		*	*	H	·
3. micranthum *Th.*		G	K	*	U
4. repens *L.*		*	*	H	·
undulatum L.		*	*	*	·
2, *Roerkruid.*					
Gorteria L. (l.c. 469)					
1. diffusa *Th.*		G	·	·	·
2. personata *L.*		*	*	H	U
Haplocarpha Less. (l.c. 464)					
1. lyrata *Harv.*		·	·	H	U
scaposa Harv.		*	*	*	·
Helichrysum DC. (l.c. 207)					
1. anomalum (*Sch. Bip.*) *Less.*		G	K	H	U
2. appendiculatum (*Th.*) *Less.*		G	K	H	U
3. argenteum *Th.*		·	K	H	U
auriculatum Th.) Less.		*	*	*	·
4. capillaceum (*Th.*) *Less.*		*	*	H	·
5. capitellatum (*Th.*) *Less.*		*	*	H	U
6. cylindricum (*L.*) *Less*		G	·	·	U
7. cymosum (*L.*) *Less.*		G	K	H	·
8. declinatum (*L.f.*) *Less.*		*	K	H	·
9. Dregeanum *Harv. & Sond.*	C	·	·	·	U
10. ericaefolium *Less.*		·	·	·	U
var. albidulum (*DC.*)		·	·	H	·
var. laxum (*Harv.*)		·	·	H	·
var. lineare (*Harv.*)		·	K	·	·
var. vulgare (*Harv.*)		·	·	H	·

[1] G. subulata *R. Br.* [2] G. ferruginea *DC.*

11. ericoides *Pers.*	·	·	·	U
12. excisum (*Th.*) *Less.*	G	·	·	U
13. felinum (*Th.*) *Less.*	G	K	H	U
14. foetidum (*Th.*) *Cass.*	G	K	H	U
15. gymnocomum *DC.*	G	K	H	·
16. intricatum *DC.*	G	·	·	·
17. lancifolium *Th.*	G	*	H	U
18. latifolium (*Th.*) *Less.*	*	*	H	·
19. leiopodium *DC.*	*	K	H	U
20. maritimum (*L.*) *Less.*	*	K	·	·
21. mucronatum (*Berg.*) *Less.*	G	K	·	U
22. Mundii *Harv.*	·	·	·	U
23. niveum (*L.*) *Less.*	·	·	·	U
var. longifolium (*DC.*)	·	K	·	U
24. nudifolium (*L.*) *Less.*	G	K	·	·
25. odoratissimum (*L.*) *Less.*	G	K	H	U
26. orbiculare (*Th.*) *Druce*[1]	G	K	H	U
27. paniculatum (*L.*) *Th.*	G	K	·	U
28. panduratum *O. Hoffm.*	G	·	·	U
29. parviflorum *DC.*	·	K	·	U
pedunculare (L.) DC.	*	*	*	·
30. petiolatum (*L.*) *DC.*	G	K	H	U
31. psilolepis *Harv.*	·	·	·	U
32. quinquenerve (*Th.*) *Less.*	G	K	H	·
33. recurvatum (*L.f.*) *Th.*	G	*	*	·
34. retortum *Th.*	*	*	*	U
35. rosum (*Berg.*) *Less.*	G	K	H	U
36. rugulosum *Less.*	·	K	H	U
37. simillimum *DC.*	G	*	*	·
38. sordescens *DC.*	·	·	H	·
39. splendidum (*Th.*) *Less.*	*	*	*	U
40. striatum *Th.*	·	·	H	·
var. villosum (*DC.*)	·	·	H	·
41. subdecurrens *DC.*	G	·	·	·
42. subglomeratum *Less.*	·	·	H	·
43. squamosum *Th.*	*	*	H	·
44. teretifolium (*L.*) *Less.*	G	K	H	U
45. tricostatum (*Th.*) *Less.*	·	·	H	·
46. undatum (*Th.*) *Less.*	·	K	*	·
47. vellereum *R. A. Dyer*	·	·	H	·
48. vestitum (*L.*) *Less.*	G	K	*	·
49. Zeyheri *Less.*	G	*	H	U
30, *Hotnots kooigoed.* 48, *Everlasting.*				
Helipterum DC. (l.c. 256)				
1. canescens (*L.*) *DC.*	*	*	*	U
2. citrinum (*Less.*) *Harv. & Sond.*	·	·	·	U
3. eximium (*L.*) *DC.*	G	K	H	·
4. gnaphaloides (*L.*) *DC.*	*	K	·	U

[1] H. serpyllifolium *Less.*

5. milleflorum (*L.f.*) *Druce*[1]		·	·	H	U
6. virgatum (*Willd.*) *DC.*		·	·	H	U
3, *Zievejahrsblom.*					
Hertia Neck. (under **Doria** Less., l.c. 320)					
1. alata (*Th.*) *O. Kze.*[2]		·	·	H	U
2. Kraussii (*Sch. Bip.*)[3]		·	·	H	·
Hippia L. (l.c. 170)					
1. frutescens *L.*		G	K	H	U
2. pilosa (*Berg.*) *Druce*[4]		G	*	H	U
Hirpicium Cass. (l.c. 485)					
1. echinulatum *Cass*	C	·	·	·	U
2. integrifolium *Less.*	C	·	·	·	U
Hypochoeris L. (l.c. 525)					
1. glabra *L.*	†	·	·	H	·
2. radicata *L.*	†	*	*	H	U
var. rostrata (*Moris.*)		·	·	H	·
Ifloga Cass. (under **Trichogyne** Less., l.c. 285)					
1. glomerata (*Harv.*)[5]		·	·	H	·
2. polycnemoides *Fenzl*[6]		*	*	H	U
Iphiona Cass.					
1. baccharidifolia *Benth. & Hook.*		·	·	·	U
Kleinia L. (l.c. 315)					
1. aizoides *DC.*		G	K	·	U
2. articulata (*L.*) *Haw.*		·	·	·	U
3. crassulaefolia *DC.*		*	K	*	·
4. ficoides (*L.*) *Haw.*		·	·	H	·
5. radicans (*Th.*) *DC.*		G	*	H	U
6. repens (*L.*) *Haw.*		·	·	H	·
Lachnospermum Willd. (l.c. 272)					
1. ericoides *Willd.*		G	*	H	U
Lactuca L. (l.c. 526)					
1. capensis *Th.*		·	·	·	U
Landtia Less. (l.c. 466)					
1. nervosa (*Th.*) *Less.*		G	K	H	U
Lasiopogon Cass. (l.c. 264)					
1. muscoides *DC.*	C	·	·	·	U
Lasiospermum Lag. (l.c. 153)					
1. bipinnatum (*Th.*) *Druce*[7]		G	*	*	U
Leontonyx Cass. (l.c. 205)					
1. angustifolius *DC.*		G	·	·	·
2. glomeratus (*L.*) *DC.*		G	K	H	U
3. spathulatus (*Th.*) *Less.*		*	*	H	U
4. squarrosus (*L.*) *DC.*		G	K	H	·
Leyssera L. (l.c. 293)					
1. gnaphalioides *L.*		G	*	H	U
2. tenella *DC.*		G	·	·	U
1, *Geelblommetje tee.* 2, *Vaal tee.*					

[1] H. phlomoides *DC.* [2] Doria alata *Th.* [3] Doria Kraussii *Sch. Bip.* [4] H. gracilis *Less.* [5] Trichogyne glomerata *Harv.* [6] Trichogyne verticillata *Less.* [7] L. radiatum *Trev.*

Mairia Nees (l.c. 64)				
1. crenata (*Th.*) *Nees*	G	K	H	U
Matricaria L. (l.c. 163)				
1. nigellaefolia *DC.*	G	K	*	·
Metalasia R. Br. (l.c. 265)				
1. aurea *Don*	·	·	H	·
2. fasciculata (*Th.*) *Don*	G	*	*	·
3. gnaphalodes (*Th.*) *Druce*[1]				
var. lutescens (*Harv.*)	·	·	·	U
var. pallescens (*Harv.*)	G	K	H	·
4. muricata (*L.*) *Less.*				
var. aristata (*DC.*)	G	·	·	·
vor. obtusiuscula (*Harv.*)	·	K	H	·
var. tomentosa (*DC.*)	·	·	H	U
5. phylicoides *Don*	G	*	H	·
6. pungens *Don*	·	·	·	U
7. *sp.* (M. Cooperi *Hutch. ms.*)	·	·	H	U
8. *sp.* (M. gemmulifera *Hutch. ms.*)	G	K	H	U
9. *sp.* (M. lasiocephala *Hutch. ms.*)	·	K	·	·
10. pallida *Bolus*	·	·	·	U
4, *Blombos.*				
Microglossa DC.				
1. mespilifolia *Benth.*	·	·	H	·
Mikania Willd. (l.c. 58)				
1. scandens (*Th.*) *Willd.*[2]	·	·	H	·
Nestlera Spreng. (l.c. 295)				
1. humilis *Less.* C	·	·	·	U
Nidorella Cass. (l.c. 86)				
1. foetida (*L.*) *DC.*	*	*	H	·
mespilifolia (Less.) DC.	*	*	*	·
Oedera L. (l.c. 134)				
1. imbricata *Lam.*[3]	G	K	*	·
2. prolifera *L.f.*	*	*	H	U
Oldenburgia Less. (l.c. 512)				
1. paradoxa *Less.*	G	·	·	·
Oligocarpus Less. (l.c. 433)				
1. calendulaceus (*L.f.*) *Less.*	G	·	·	U
Osmites L. (l.c. 303)				
1. Bellidiastrum *Th.*	G	K	H	·
Osteospermum L. (l.c. 433)				
1. corymbosum *L.*[4]	G	·	·	U
2. decumbens *Fourc.*	·	·	H	·
3. herbaceum *L.f.*	*	K	*	·
4. imbricatum *L.*[5]	G	*	*	U
s. sp. glandulosa (*Spreng.*) *T. Norlindh*[6]	G	K	H	·
var. intermedia *T. Norlindh*[7]	·	·	H	·
var. dichotomum (*E. Mey.*) *T. Norlindh*[8]	·	·	H	·

[1] M. pulcherrima *Less.* [2] M. capensis *DC.* [3] O. latifolia *Less.* [4] O. Burchellii *DC.*
[5] Incl. O. imbricatum (*L.*) *DC non Harv.*, O. corymbosum (*L*) *DC. p.pt.* et var. parviflorum *Harv.* [6] Incl. O. corymbosum (*L*) *DC.p.pt.* et var. lasiocaulon *DC. p. pt.* [7] O. corymbosum var lasiocaulon *DC. p. pt.* [8] O. corymbosum var. rotundifolium *DC. p. pt.*

5. junceum *Berg.*[1]	·	K	H	U
6. moniliferum *L.*	*	K	H	U
7. nervatum *DC.*	·	K	H	U
8. pisiferum *L.*	·	·	·	U
9. polygaloides L.[2]	G	*	*	·
10. scabrum *Th.*	·	K	*	U
11. triquetrum *L.f.*	G	·	·	·
6, *Bietou.*				
Othonna L. (l.c. 327, incl. **Doria** Less., p.p., l.c. 320)				
1. carnosa *Less.*	G	K	H	·
2. denticulata *Ait.*[3]	*	K	H	U
3. filicaulis *Jacq.*	·	K	·	·
4. Gymnodiscus *Sch. Bip.*[4]	·	·	H	·
5. Lingua *L.f.*[5]				
var. Jacquini (*Harv.*)	·	·	H	·
6. membranifolia *DC.*	·	·	H	·
7. parviflora *L.*	*	*	H	U
8. perfoliata *Jacq.*[6]	*	K	·	·
9. rufibarbis *Harv.*	·	·	H	·
Pentzia Th. (l.c. 171 and under **Matricaria** L. l.c. 163)				
1. dentata (*L.*) *O. Kze.*[7]	·	·	·	U
2. incana (*Th.*) *O. Kze.*[8] *var.* microcephala (*Hutch.*).	*	K	*	U
3. pilulifera (*L.f.*) *Fourc.*[9]	*	K	*	U
2, *Goed Karroo, Schaapbos.*				
Peyrousea DC. (l.c. 176)				
1. argentea *Compton*	G	·	·	U
2. umbellata (*L.f.*) *Fourc.*[9a]	G	K	H	·
2, *Bels.*				
Picris L.				
1. echioides *L.* †	·	·	H	·
Platycarpha Less. (l.c. 54)				
1. glomerata *Less.*	·	·	H	·
Printzia Cass. (l.c. 513)				
1. cernua (*Berg.*) *Druce*[10]	*	K	H	U
2. pyrifolia *Less.*	·	·	H	·
Pteronia L. (l.c. 95)				
1. camphorata *L.*	G	K	·	·
2. corymbosa *Less.*	·	·	H	·
3. elongata *Th.*	*	*	H	·
4. erythrochaeta *DC.*	G	·	·	·
5. fasciculata *L.f.*	·	·	·	U
6. flexicaulis *L.f.*	G	·	·	·
7. glomerata *L.f.*	·	·	·	U
8. hirsuta *L.f.*	·	·	H	·
9. incana (*Burm.*) *Less.*	G	*	H	U
10. membranacea *L.f.*	G	*	*	U
11. pallens *L.f.*	G	·	·	·

[1] O. coriaceum *DC.* [2] Incl. O. imbricatum (*L.*) *Harv.* [3] O. amplexicaulis *Th.*
[4] Doria Gymnodiscus *DC.* [5] Doria Lingua *Less.* [6] Doria perfoliata *Th.*
[7] P. flabelliformis *Willd.* [8] P. virgata *Less.* [9] Matricaria globifera *Fenzl.* [9a] P. calycina *DC.*
[10] P. Bergii *Cass.*

12. paniculata *Th.*	G	*	*	·
13. stricta *Ait.*	G	*	H	U
14. teretifolia (*Th.*) *Fourc.*[1]	·	K	H	U
15. viscosa *Th.* C	·	·	·	U
1, 7, *Gombos.* 11, *Scholtzbossie.*				
Pulicaria Cass. (l.c. 121)				
1. scabra (*Th.*) *Druce*[2]	*	K	*	·
var. erigeroides (*Harv.*)	·	·	·	U
Relhania L.'Hér. (l.c. 298)				
1. calycina (*L.f.*) *Poiret*[3]	G	K	H	·
2. genistaefolia (*L.*) *L'Hér.*	G	K	H	U
3. Patersoniae *L. Bol.*	·	·	H	U
4. pedunculata (*DC.*) *Harv.*	G	·	·	·
5. pumila *Th.*	G	·	·	·
6. pungens *L'Hér.*	G	K	*	·
7. rigida *Hoffm. & Muschl.*	·	K	·	·
8. sessiliflora (*L.f.*) *Th.*	G	*	H	U
9. squarrosa *L.*	G	*	H	U
10. speciosa (*DC.*) *Harv.*	·	·	H	U
11. trinervis *Th.*	G	K	H	·
Senecio L. (l.c. 346)				
1. albanensis *DC.*	G	K	*	U
2. amabilis *DC.*	·	K	·	U
3. angulatus *L.f.*	·	K	H	·
4. arnicaeflorus *DC.*	*	K	·	·
5. Burchellii *DC.*	*	K	H	·
6. canalipes *DC.*	·	·	H	·
7. carnosus *Th.*[4]	·	K	H	·
8. concolor *DC.*	·	·	H	U
9. coronatus *Harv.*[7]	·	K	H	·
10. crenatus *Th.*	·	K	H	·
11. cristatus *Th.*	·	·	·	U
12. deltoideus *Less.*	·	K	H	·
13. denticulatus (*Th.*)[5]	·	K	H	U
14. Diodon *DC.*	·	·	H	·
15. dissidens *Fourc.*	·	·	·	U
16. dumosus *Fourc.*	·	·	·	U
17. elegans L.[6]	*	K	·	·
18. eriobasis *DC.*	·	·	H	·
19. erosus *L.f.*	G	*	H	U
20. erubescens *Sol.*	*	K	H	U
21. euryopoides *DC.*	·	·	·	U
22. glastifolius *L.f.*	G	K	H	·
23. glutinosus *Th.*	*	*	H	·
24. gramineus *Harv.*	G	*	*	·
25. hastulatus *L.*	*	*	H	U
var. nudiusculus (*Harv.*)	·	·	·	U
26. ilicifolius *Th.*	G	K	H	·

[1] P. baccharoides *Less.*, incl. P. trigona *Phillips.* [2] P. capensis *DC.* [3] R. quinquenervis *Th.* [4] S. elegans var diffusus *Harv.* [5] S. othonnaeflorus *DC.* [6] S. elegans var. erectus *Harv.* [7] S. laziorhizus *DC.*

27. inaequidens *DC.*	*	K	H	·
28. junceus (*Less.*) *Harv.*	·	K	*	U
29. juniperinus *L.*	G	K	H	U
30. lanceus *Ait.*	*	K	*	·
var. serratus (*Harv.*)	·	·	·	U
31. laevigatus *Th.*	*	*	H	U
var. integrifolius (*Harv.*)	·	·	H	·
32. leptophyllus *DC.*	G	*	H	U
33. lineatus (*L.f.*) *DC.*	*	K	H	·
34. litorosus *Fourc.*	·	·	H	·
35. littoreus *Th.*	G	*	*	·
var. hispidulus (*Harv.*)	·	·	H	·
36. longifolius *L.*	*	K	H	·
37. lyratus *L.f.*	*	*	H	U
38. macroglossus *DC.*	·	K	*	·
39. multibracteatus *Harv.*	G	*	H	·
40. oederiaefolius *DC.*	·	K	H	·
41. oliganthus *DC.*	*	K	H	U
42. othonniformis *Fourc.*[1]	*	K	*	·
43. paniculatus *Berg.*	·	·	·	·
var. peucedanifolius (*Harv.*)	·	·	·	U
var. reclinatus (*Harv.*)	·	K	H	U
44. pellucidus *DC.*	·	·	H	U
45. penninervius *DC.*	·	K	·	·
46. pinifolius (*L.*) *Lam.*	*	*	*	U
47. pinnulatus *Th.*	*	K	H	·
48. pterophorus *DC.*	·	K	·	·
49. purpureus *L.*	G	K	H	U
50. quinquelobus (*Th.*) *DC.*	·	K	*	·
51. quinquenervius *Sond.*	·	K	*	·
52. repandus *Th.*	G	·	·	·
53. rhomboideus *Harv.*	·	·	H	·
54. rigidus *L.*	*	K	H	·
55. rosmarinifolius *L.f.*	*	K	H	U
56. scandens *DC.*[2]	·	K	H	·
57. scaposus *DC.*	·	·	H	U
58. speciosus *Willd.*	G	K	H	·
59. striatifolius *DC.*	·	K	H	U
60. Thunbergii *Harv.*	·	·	H	·
61. triplinervius *DC.*	·	K	H	·
62. umbellatus *L.*	G	*	H	·
63. vimineus *DC.*[3]	·	·	H	·
64. vulgaris *L.* †	*	K	·	·
65. n. sp. *F.* 1119, 2892	·	·	H	U
66. vestitus *Berg.*	*	K	·	·
Sonchus L. (l.c. 527)				
1. asper *Gaertn.* †	*	*	H	·
2. Dregeanus *DC.*	*	*	*	U

[1] S. paucifolius *DC* (1837) non *S. G. Gmelin* (1774). [2] S. mikanioides *Otto.*
[3] Non *Harv.* S. vimineus. *Harv.* = S. Harveyanus *McOwan.*

3. Ecklonianus *DC.*	*	*	H	·
4. oleraceus *L.* †	*	*	H	·
4, *Sow thistle.*				
Stilpnophytum Less. (l.c. 186)				
1. linifolium (*Th.*) *Less.*	·	K	·	U
2. longifolium (*Th.*) *Less.*	G	K	·	U
Stoebe L. (l.c. 279)				
1. aethiopica L.	G	K	·	U
2. alopecuroides (*Lam.*) *Less.*	G	K	H	U
3. Burchellii *Levyns*	·	·	·	U
4. Ensori *Compton*	·	K	H	U
5. microphylla *DC.*	G	·	·	U
6. phyllostachya *Sch. Bip.*[1]	*	K	·	U
7. plumosa *Th.*[1a]	·	K	H	U
7, *Slangbos.*				
Tagetes L.				
1. minuta *L.* †	·	·	H	·
Mexican Marigold, Khaki bos.				
Tarchonanthus L. (l.c. 118)				
1. camphoratus *L.*	*	K	*	U
2. minor *Less.*	·	·	·	U
Thaminophyllum Harv. (l.c. 155)				
1. multiflorum *Harv.*	G	·	·	·
Tolpis Bivon (under **Hieracium** L. l.c. 529)				
1. capensis (*L.*) *Sch. Bip.*[2]	*	K	H	U
Tripteris Less. (l.c. 424)				
1. Bolusii *R. H. Compton*	G	·	·	·
2. glabra *var.* glandulosa *C. A. Smith*	·	·	H	·
3. sinuata *DC.* C	·	·	·	U
Ursinia Gaertn. (l.c. 150, incl. **Sphenogyne** R. Br. l.c. 137)				
1. anethoides *N. E. Br.*[3]	G	*	·	·
var. ramosissima (*Harv.*)	·	·	H	U
2. annua *Less.*	·	·	·	·
var. nana (*Harv.*)	·	K	H	U
3. anthemoides (*L.*) *Poir.*	*	*	H	U
4. Bolusii *Thell.*	·	·	·	U
5. chrysanthemoides (*Less.*) *Harv.*	G	K	H	·
6. discolor (*Less.*) *N. E. Br.*[4]	G	*	H	U
7. foeniculacea (*Jacq.*) *Poir.*[5]	*	K	*	·
8. heterodonta (*DC.*) *N. E. Br.*[6]	G	K	H	U
9. pauciloba (*DC.*) *N. E. Br.*[7]	G	·	·	·
10. pilifera (*Th.*) *Gaertn.*[8]	·	·	·	U
11. scapiformis (*DC.*) *N. E. Br.*[9]	·	·	·	U
12. scariosa (*Willd*) *Poir.*[10]	G	K	H	U
13. serrata (*Th.*) *Poir.*[11]	G	K	H	U
14. subhirsuta (*DC.*) *N. E. Br.*[12]	*	K	H	·
15. trifida (*Th.*) *N. E. Br.*[13]	G	K	·	·

[1] S. phlaeoides *Sch. Bip.* [1a] S. cinerea *Th.* [2] Hieracium capense *L.*
[3] Sphenogyne anethoides *DC.* [4] S. discolor *Less.* [5] S. foeniculacea *Less.*
[6] S. heterodonta *DC.* [7] S. pauciloba *DC.* [8] S. pilifera *Less.* [9] S. scapiformis *DC.*
[10] S. scariosa *R. Br.* [11] S. serrata *DC.* [12] S. subhirsuta *DC.* [13] S. trifida *Less.*

Venidium Less. (l.c. 458)				
1. arctotoides (*L.f.*) *Less.*	·	K	H	U
2. decurrens *Less.*	·	K	*	U
var. calendulaceum (*Harv.*)	·	K	·	·
3. discolor *Less.*	*	K	H	·
4. hispidulum *Less.*	·	·	H	·
5. microcephalum *DC.*	·	·	H	U
6. perfoliatum *Less.*	G	*	H	·
Vernonia Schreb. (l.c. 48)				
1. capensis (*Houtt.*) *Druce*[1]	G	K	H	U
2. mespilifolia *Less.*	*	K	*	·
Xanthium L.				
1. spinosum *L.* †	·	·	H	·
Burweed, Boetebossie.				
CONVOLVULACEAE. Fl. Cap. iv, s. 2, p. 45.				
Convolvulus L. (l.c. 70)				
1. arvensis *L.* †	·	·	H	·
2. capensis *Burm.*	*	*	*	U
3. farinosus *L.*	*	K	H	·
4. filiformis *Th.*	G	*	H	U
5. hastatus *Th.*	*	K	*	U
6. multifidus *Th.*	·	·	H	·
7. ulosepalus *Hall. f.*	·	·	H	U
1, *Bindweed.*				
Cuscuta L. (l.c. 83)				
1. africana *Th. var.* capensis (*Bak.*)	G	K	H	U
2. alpestris *Fourc.*	·	K	·	·
3. appendiculata *Engelm.* †	·	·	H	U
4. cassytoides *Nees*	·	K	·	·
Dodders.				
Dichondra Forst. (l.c. 83)				
1. repens *Forst.*	*	K	*	·
Falkia L. l.c. 81)				
dichondroides Bak.	*	*	*	·
1. repens *L.f.*	G	K	H	·
Ipomoea L. (l.c. 46)				
1. Bowieana (*Rendle*) *Bak.*	G	·	·	·
2. ficifolia *Lindl.*	·	·	H	·
3. Pes-caprae (*L.*) *Roth*[2]	·	K	*	·
4. simplex *Th.*	·	·	H	·
CORNACEAE. Fl. Cap. ii, p. 570.				
Curtisia Ait. (l.c. 570)				
1. faginea *Ait.*	G	K	H	U
Assagai, Assegaai.				

[1] V. pinifolia *Less.* [2] I. biloba *Forsk.*

CRASSULACEAE. Fl. Cap. ii, p. 327.				
Adromischus Lemaire (under **Cotyledon** L. l.c. 370)				
1. caryophyllacea (*Burm. f.*) *Lem.*[1]	·	·	H	·
2. cristatus (*Haw.*) *Lem.*[2]	·	·	H	U
3. maculatus (*Salm-Dyk*) *Lem.*[3]	G	·	·	·
4. mammillaris (*L.f.*) *Lem.*[4]	·	·	·	U
5. rhombifolius (*Haw.*) *Lem.*[5]	G	·	·	U
6. triflorus (*L.f.*) *Berger*[6]	·	·	·	H
1, *Nenta bossie.*				
Cotyledon L. (l.c. 370)				
1. cacalioides *L.f.*	·	·	·	U
coruscans Haw.	*	*	*	·
2. Deasii *Schonl.*	·	·	·	U
3. decussata *Sims*	G	*	H	U
4. flavida *Fourc.*	·	·	H	·
5. leucothrix (*C. A. Sm.*) *Fourc.*[7]	·	·	·	U
6. orbiculata *L.*	*	K	H	·
7. paniculata *L.f.*[7a]	G	·	·	·
8. papillaris *Th.*	·	·	·	U
9. purpurea *Th.*	·	·	H	·
10. ramosissima *Harv.*	G	*	H	·
11. teretifolia *Th.*	·	·	H	·
tuberculosa Lam.	*	*	*	·
12. ventricosa *Burm.*	G	·	·	U
5, *Hondeoor.* 6, *Boterblom.* 9, *Kouterie.* 11, *Nenta.*				
Crassula L. (l.c. 332, incl. **Bulliarda** DC., l.c. 329, and **Helophytum** E. & Z., l.c. 328)				
1. acutifolia *Lam.*	·	·	H	U
2. arborescens *Willd.*	·	·	H	·
campestris Harv.	*	*	*	·
3. capensis (*L.f.*)[8] *var.* obovata *Schonl.*	*	*	H	·
4. cephalophora *Th. var.* dubia *Schonl.*[9]	G	*	*	U
var. Thunbergii *Schonl.*[10]	G	*	*	·
5. ciliata *Th.*	*	*	H	U
6. clavifolia *Harv. var.* rosularis (*Schonl.*)	·	K	H	U
7. columnaris *Th.*	G	·	·	U
8. corymbosa *Link & Otto*	·	·	·	U
9. corymbulosa *Link & Otto*	G	*	H	U
10. cordata *Th.*	·	·	H	·
11. crenulata *Th.*	*	K	H	U
12. cultrata *L.*	G	*	H	U
13. decumbens *Th.*[11]	*	*	H	·
14. deltoidea *Th.*[12]	·	·	·	U
15. divaricata *E. & Z.*	·	·	·	U
16. ericoides *Haw.*	*	K	H	U

[1] Cotyledon caryophyllacea *Burm. f.* [2] C. cristata *Haw.* [3] C. maculata *Salm-Dyk.*
[4] C. mammillaris *L. f.* [5] C. rhombifolia *Haw.* [6] Under C. hemisphaerica *L.*
[7] Adromischus leucothrix *C. A. Sm.* [7a] C. fascicularis *Ait.* [8] Helophytum natans *E. & Z.*
[9] C. canescens *Schultes.* [10] C. canescens var. latifolia *Harv.*
[11] Bulliarda trichotoma *E. & Z.* [12] C. rhomboidea *N. E. Br.*

17. expansa *Ait.*	G	K	H	·
18. falcata *Wendl.*	·	·	H	·
19. fastigiata *Schonl.*	*	K	H	·
20. Fergusoniae *Schonl.*	·	·	·	U
21. glomerata *L.*	*	*	H	·
22. Harveyi *Britt. & Baker*[1] *var.* intermedia (*Schonl.*)	·	K	H	·
23. hemisphaerica *Th.*	G	·	·	U
24. inanis *Th.*[2]	G	K	*	·
25. Kuhnii *Schonl.*[3]	·	K	H	U
26. lactea *Soland.*	·	K	·	·
27. lineolata *Dryand.*[4]	*	*	H	·
28. lycopodioides *Lam.*	*	K	H	U
29. marginalis *Soland.*[5]	G	K	*	·
30. mollis *Th.*[6]	*	K	H	·
31. nemorosa *Endl.*	·	·	H	·
32. obvallata *L.*	·	K	H	·
33. orbicularis *L.*	G	K	·	·
34. papillosa *Schonl. & Bak. f.*	·	K	H	·
parvula Endl.	*	*	*	·
35. pellucida *L.*	G	*	*	·
36. perforata *Th.*	*	K	H	U
37. platyphylla *Harv.*	·	K	·	·
38. punctulata *Schonl. & Bak. f.*	*	K	*	·
39. pyramidalis *Th.*	·	·	·	U
40. radicans *Harv. var.* Phillipsii (*Schonl.*)	·	·	·	U
41. ramosa *Th.*	G	K	H	U
42. Rattrayi *Schonl. & Bak. f.*	·	·	H	·
43. rosularis *Haw.*	G	K	*	U
44. rubricaulis *E. & Z.*	*	K	H	·
45. rupestris *Th.*	G	K	*	U
46. Saxifraga *Harv.*	*	*	H	·
47. sarmentosa *Harv.*	·	K	·	·
48. Septas *Th.*	*	K	·	·
49. Smutsii *Schonl.*[7]	G	·	·	U
50. spatulata *Th.*	·	·	H	·
51. tecta *Th.*	·	·	·	U
52. Turrita *Th.*	·	·	H	U
umbellata Th.	*	*	*	·
Vaillantii Roth	*	*	*	·
Dinacria Harv. (l.c. 330)				
1. sebaeoides *Schonl.*	G	·	H	U
Kalanchoe Adanson (l.c. 378)				
1. rotundifolia *Haw.*	·	·	H	·
Rochea DC. (l.c. 368)				
jasminea DC.	*	*	*	·

[1] C. alpestris *Harv.* [2] Helophytum inane *E. & Z.* [3] C. fruticulosa *L.* ? [4] C. centauroides *L*
[5] C. pellucida var marginalis (*Harv.*). [6] C. margaritifera *E. & Z.*
[7] C. margaritifera *Harv. non E. & Z.*

CRUCIFERAE. Fl. Cap. i, p. 19.

Brachycarpaea DC. (l.c. 33)				
1. capensis (L.)[1]	G	·	·	U
2. laxa (*Th.*) *Sond.*	G	·	·	U
Brassica L. (l.c. 31, and under **Sinapis** Koch, l.c. 32)				
1. arvensis (*L.*) *O. Kze.*[2] †	·	K	·	·
2. nigra (*L.*) *Koch* †	*	K	H	·
3. retrorsa (*Burch.*) *Druce*[2a] †	·	K	*	·
4. strigosa (*Th.*) *DC.*[2b]	·	K	H	U
2, *Black mustard.*				
Capsella Medik. (l.c. 31)				
1. Bursa-pastoris (*L.*) *Moench* †	G	*	*	·
Shepherd's purse.				
Cardamine L. (l.c. 23)				
1. africana *L.*	G	K	H	·
Coronopus Gaertn. (under **Senebiera** Poir., l.c. 27)				
1. didyma (*L.*) *Sm.*[3] †	*	K	H	·
Heliophila L. (l.c. 35)				
1. carnosa (*E. & Z.*) *Steud.*[4]	·	·	H	·
2. cornigera *Fourc.*	·	·	H	·
3. crithmifolia (*Roth*) *Willd.*	*	*	H	·
4. glauca *Burch.*	·	K	H	U
5. integrifolia *L.*[5]	·	·	H	·
6. linearifolia *Burch.*	*	K	H	U
var. hirsuta (*Burch.*[6]	·	K	·	U
var. lanceolata (*Sond.*)	G	K	H	·
var. filifolia (*Sond.*)	·	·	·	U
7. linearis (*Th.*) *DC.*	*	K	*	·
8. pectinata *Burch.*	*	*	H	·
9. pendula *Willd.*	*	K	H	·
10. rivalis *Burch.*	*	K	H	U
11. Schlechteri *Schinz*	G	·	·	·
12. stylosa *Burch.*[7]	G	K	H	U
13. suavissima *Burch.*	·	·	·	U
14. subulata *Burch.*	G	K	H	U
var. glabrata (*Sond.*)	*	*	H	·
15. virgata *Burch.*	·	K	H	·
Lepidium L. (l.c. 28)				
1. decumbens *Desv.*	·	K	·	·
2. divaricatum *Sol.*	G	·	·	·
3. Eckloni *Schrad.*	·	·	·	·
var silvaticum (*E. & Z.*) *Thell.*	·	·	H	·
4. linoides *Th.*	·	·	·	U
var. subdentata (*Burch.*) *Thell.*	·	·	H	U
5. pinnatum *Th.*	·	·	H	·
6. trifurcum *Sond.*	·	·	·	U

[1] B. varians *DC.* [2] Sinapis arvensis *L.* [2a] Sinapis retrorsa *Burch.*
[2b] Incl. B. leptopetala *Sond.* [3] Senebiera didyma *Pers.* [4] H. florulenta *Sond.*
[5] H. pilosa var. integrifolia *Harv.* [6] H. linearifolia var. pilosiuscula *Sond.*
[7] Incl. H. dolichostyla *Schltr.*

Raphanus L.				
1. Raphanistrum *L.* .... †	*	*	H	·
Jointed Charlock. Ramenas.				
Rorippa Scop. (under **Nasturtium** L., l.c. 21)				
1. nasturtium-aquaticum (*L.*) *Hayek*[1] .... †	*	K	H	U
Watercress.				
Sisymbrium L. (l.c. 24)				
1. capense *Th.*	*	K	H	·
2. lyratum *Burm.*	*	K	·	U
CUCURBITACEAE. Fl. Cap. ii, p. 482.				
Coccinia Wight & Arn. (under **Cephalandra** Schrad., l.c. 492)				
1. quinqueloba (*Th.*) *Cogn.*[2]	·	·	H	·
Cucumis L. (l.c. 494)				
1. africanus *L.f.*	G	*	*	·
myriocarpus Naudin	*	*	*	·
Kedrostis Medik. (l.c. 483, under **Coniandra** Schrad.)				
1. nana (*Lam.*) *Cogn.*	G	*	H	·
2. Schlechteri *Cogn.*	·	·	H	·
3. Zeyheri (*Schrad.*) *Cogn.*[3]	·	·	H	U
Melothria L. (l.c. 485, under **Zehneria** Endl.)				
1. hederacea (*Sond.*) *Cogn.*[4]	·	·	H	·
2. obtusiloba (*Sond.*) *Cogn.*[5]	·	K	*	·
3. punctata (*Th.*) *Cogn.*[6]	G	K	H	·
In general, Davidjes wortel.				
Peponia Naudin				
1. Mackenii *Naud.*	·	K	·	·
Sphaerosicyos Hook. f. (l.c. 490, under **Luffa** Tourn.)				
1. sphaericus (*Sond.*) *Hook. f.*[7]	·	K	·	·
CUNONIACEAE. Fl. Cap. ii, p. 306.				
Cunonia L. (l.c. 306)				
1. capensis *L.*	*	K	H	U
Rooiels, Red Els.				
Platylophus D. Don (l.c. 307)				
1. trifoliatus (*Th.*) *D. Don*	G	K	H	U
Witels, White Els.				
DIPSACEAE. Fl. Cap. iii, p. 41.				
Cephalaria Schrad.				
1. attenuata *R. & S.*	G	K	H	·
rigida (L.) Schrad.				
Scabiosa L. (l.c. 43)				
1. anthemifolia *E. & Z.*[8]	*	K	H	U

[1] Nasturtium officinale *R. Br.* [2] Cephalandra quinqueloba *Schrad.*
[3] Coniandra Zeyheri *Schrad.* [4] Zehneria hederacea *Sond.* [5] Zehneria obtusiloba *Sond.*
[6] Zehneria scabra *Sond.* [7] Luffa sphaerica *Sond.* [8] Under S. Columbaria *L.* in Fl. Cap.

DROSERACEAE. Fl. Cap. i, p. 75.				
Drosera L. (l.c. 75)				
1. capensis *L.f.*	*	*	H	U
2. cistiflora *L.*	G	*	H	·
var. alba (*Sond.*)	·	·	·	U
3. curviscapa *Salter*[1]	G	K	H	U
Sundews.				
EBENACEAE. Fl. Cap. iv, s. i., p. 444.				
Euclea Murr. (l.c. 460)				
1. acutifolia *E. Mey.*	*	*	H	·
2. daphnoides *Hiern.*	*	*	H	U
3. lanceolata *E. Mey.*	G	K	H	U
4. macrophylla *E. Mey.*	·	K	H	·
5. multiflora *Hiern.*	*	K	H	·
6. polyandra (*L.f.*) *E. Mey.*	*	K	H	U
7. racemosa *Murr.*	G	K	H	·
8. undulata *Th.*	*	*	H	·
3, *Bos Ghwarrie.* 6, 7, *Kersebos.* 8, *Ghwarrie.*				
Royena L. (l.c. 445)				
1. glabra *L.*	G	K	H	·
2. cordata *E. Mey.*	·	·	H	U
3. hirsuta *L.*	*	*	*	U
4. lucida *L.*	G	K	*	·
5. pallens *Th.*	*	K	H	·
6. Simii *O. Kze.*	G	K	H	·
1, *Kraaibos.* 4, *Swartbas.* 5, *Bloubos.* 6, *Tolbos.*				
ELATINACEAE. Fl. Cap. i, p. 115.				
Bergia L. (l.c. 115)				
1. glomerata *L.f.*	*	*	H	·
ERICACEAE. Fl. Cap. iv, s. i, p. 2.				
Acrostemon Klotzch (l.c. 350)				
1. Fourcadei *L. Guthrie*	·	·	·	U
Aniserica N. E. Br. (l.c. 391)				
1. gracilis (*Bartl.*) *N. E. Br.*	G	·	·	·
Anomalanthus Kl. (l.c. 384)				
1. scoparius *Kl.*	·	·	·	U
Blaeria L. (l.c. 319)				
1. coccinea *Kl.*	·	K	·	·
2. fuscescens *Kl.*	G	K	H	U
Coilostigma Kl. (l.c. 327)	·	·	H	·
1. tenuifolium *Kl.*	·	·	H	·
2. Zeyherianum *Kl.*	·	·	H	·
Erica L. (l.c. 4)				
1. adunca *Benth.*	G	K	H	U
2. albens *L.*	G	K	·	·
3. arachnoidea *Kl.*	G	K	H	U
4. articularis *L.*	*	*	H	U

[1] D. cuneifolia *Fl. Cap.*

5. astroites *Guthr. & Bol.*	G	K	·	·
6. bicolor *Th.*	*	K	·	·
7. brachycentra *Benth.*	·	·	·	U
8. brevifolia *Soland.*	G	K	·	·
9. caffra *L.*	G	K	H	U
10. calycina *L.*	G	K	*	U
11. calyculata *Wendl.*	G	K	H	U
12. canaliculata *Andr.*	G	K	H	U
13. Chamissonis *Kl.*	·	·	H	·
14. cerinthoides *L.*	G	K	H	U
15. chloroloma *Lindl.*	·	K	H	·
coarctata Wendl.	*	*	*	·
16. coccinea *Berg.*	*	K	·	·
17. conferta *Andr.*	·	·	·	U
18. conica *Lodd.*	G	·	·	·
19. conspicua *Soland.*	G	·	·	·
20. copiosa *Wendl.*	G	K	H	·
var. linearisepala (*Bol.*)	*	K	H	·
var. parvisepala (*Bol.*)	G	K	H	U
cordata Andr.	*	*	*	·
21. corifolia *L.*	G	*	H	·
22. coronanthera *Compton*	G	·	·	U
23. cubica *L.*	G	K	H	U
var. coronifera (*Bol.*)	·	·	H	U
24. curviflora *L.*	G	K	H	U
25. cyathiformis *Salisb. var.* orientalis (*L. Bol.*)	·	·	H	·
26. decipiens *Spreng. f.*	·	K	H	·
var. tetragona (*Bol.*)	·	·	H	·
27. deflexa *Sinclair*	·	·	H	U
28. deliciosa *Wendl. f.*	G	*	H	·
29. demissa *Kl.*	·	·	H	·
30. densifolia *Willd.*	G	K	H	U
31. diaphana *Spreng.*	*	K	H	U
32. dichrus *Spreng.*	G	K	·	·
33. discolor *Andr.*	G	K	H	·
34. exurgens *Andr.*	G	·	·	·
35. fimbriata *Andr.*	G	·	·	·
36. flocciflora *Benth.*	·	·	·	U
37. floribunda *Lodd.*	G	K	H	U
38. formosa *Th.*	G	K	H	·
39. Fourcadei *L. Bol.*	·	K	H	·
40. georgica *Guthr. & Bol.*	G	K	H	U
41. gibbosa *Kl.*	G	K	H	U
42. glandulosa *Th.*	G	K	H	·
var. breviflora (*Bol.*)	·	·	H	·
43. globosa *Andr.*	*	K	·	·
44. glomiflora *Salisb.*	G	K	H	U
var. cantharaeformis (*Bol.*)	·	K	·	·
45. glumaeflora *Kl.*	·	K	H	·
46. gracilis *Wendl.*	G	K	H	U

47. Harveiana *Guthr. & Bol.*	·	·	H	·
48. hebecalyx *Benth.*	G	·	·	U
49. hirsuta *Kl.*	G	·	·	·
50. hispidula *L.*	G	K	·	U
51. humansdorpensis *Compton*	·	·	H	·
52. inconstans *Zahlbr.*	G	K	·	U
53. Jeppei *L. Bol.*	·	·	H	·
54. Keetii *L. Bol.*	·	K	·	·
55. laevigata *Benth.*	*	K	·	U
56. lanata *Andr.*	G	K	H	U
57. Lehmanni *Kl.*	G	K	·	·
58. leucopelta *Tausch.*	·	K	H	·
59. longifolia *Ait.*	G	·	·	·
60. longipes *Kl.*	·	K	H	U
61. imbricata *L.*	*	K	·	·
62. macrophylla *Kl.*	G	·	·	·
63. maesta *Bol.*	G	K	H	·
64. manifesta *Compton*	·	·	H	U
65. melanthera *L.*	G	K	H	U
66. mucronata *Andr.*	*	K	H	U
67. Nabea *Guthr. & Bol.*	G	K	H	U
68. nemorosa *Kl.*	*	*	H	·
69. nervata *Guthr. & Bol.*	·	·	·	U
70. onusta *Guthr. & Bol.*	·	K	·	·
71. opulenta *Wendl.*	G	K	·	U
72. palliiflora *Salisb.*	G	·	·	·
73. paniculata *L.*	*	*	H	·
74. Passerinae *Montin*	·	·	H	U
75. pectinifolia *Salisb.*	·	·	H	U
76. peltata *Andr.*	G	K	H	U
77. perspicua *Wendl.*	G	·	·	·
78. Petiveri *L.*	G	*	H	·
79. petraea *Benth.*	·	·	H	U
80. Plukenetii *L.*	G	·	·	·
81. polyantha *Kl.*	·	·	H	·
82. Priori *Guthr. & Bol.*	G	·	·	·
83. quadrangularis *Salisb.*	G	K	·	·
84. ramentacea *L.*	G	K	H	·
rupicola Kl.	*	*	*	·
85. scabriuscula *Kl.*	G	K	H	·
86. selaginifolia *Salisb.*	·	·	·	U
87. seriphiifolia *Salisb.*	G	K	H	U
88. sessiliflora *L.f.*	G	K	H	·
89. Solandra *Andr.*	G	*	*	·
90. Sparmanni *L.f.*	·	·	H	U
91. speciosa *Andr.*	G	K	H	U
92. strigillifolia *Salisb.*	·	·	·	U
93. strigosa *Soland.*	*	K	·	·
94. stylaris *Spreng.*	·	K	H	U
95. subdivaricata *Berg.*	*	K	·	·

96. sulcata *Benth.*	G	·	·	·
97. taxifolia *Bauer*	*	K	·	U
98. tenuis *Salisb.*	G	*	H	U
99. tetragona *L.f.*	*	*	H	·
100. tetrathecoides *Benth. var.* latisepala (*Bol.*)	·	·	·	U
101. trachysantha *L. Bol.*	·	·	·	U
102. tragulifera *Salisb.*	G	·	·	U
103. transparens *Berg.*	·	·	·	U
104. triceps *Link.*	G	K	H	U
105. umbelliflora *Kl.*	*	*	H	·
106. unicolor *Wendl.*	G	K	·	·
107. unilateralis *Kl.*	·	·	H	·
108. viridiflora *Andr.*	G	*	H	·
109. sp. *F.* 5268	G	·	·	·
110. sp. *F.* 5321	·	·	·	U
Salaxis Salisb. (l.c. 401)				
1. axillaris (*Th.*) *Salisb.*	*	K	·	·
2. puberula *Kl.*	*	K	·	·
Scyphogyne *Brongn.* (l.c. 406)				
1. muscosa (*Ait.*) *Druce*[1]	G	·	·	·
Simocheilus *Kl.* (l.c. 357)				
1. barbiger *Kl.*	·	K	*	·
2. carneus *Kl.*	·	K	·	·
3. multiflorus *Kl.*	G	K	H	U
var. Atherstonei (*N. E. Br.*)	G	K	H	U
Syndesmanthus Kl. (l.c. 371)				
1. scaber *Kl.*	G	·	·	·
Thamnus Kl. (l.c. 356)				
1. multiflorus *Kl.*	·	·	H	U
Thoracosperma Kl. (l.c. 328)				
1. Galpini *N. E. Br.*	·	·	·	U
2. nanum *N. E. Br.*	·	·	H	·
3. paniculatum (*Th.*) *Kl.*	G	*	H	U

EUPHORBIACEAE. Fl. Cap. v, s. 2, p. 216.

Acalypha L. (l.c. 466)				
1. decumbens *Th.*	G	K	H	·
2. Eckloni *Baill.*	G	*	*	·
3. glabrata *Th.*	G	*	*	·
Adenocline Turcz. (l.c. 488)				
1. acuta (*Th.*) *Baill.*[2]	G	K	H	·
2. humilis *Turcz.*	G	*	H	·
3. ovalifolia *Turcz.*	*	*	H	·
procumbens (Mull. Arg.) Benth.	*	*	*	·
4. serrata *Turcz.*	·	K	H	·
5. sessilifolia *Turcz.*	*	*	*	U
Andrachne L. (l.c. 385)				
1. ovalis (*Sond.*) *Mull. Arg.*	G	K	*	·

[1] S. inconspicua *Brongn.* [2] A. mercurialis *Turcz.*

Cluytia L. (l.c. 427)				
1. affinis *Sond.*	G	K	H	U
2. africana *Poir.*	·	·	H	·
3. alaternoides *L.*	*	K	H	·
var. brevifolia *E. Mey.*	G	K	*	·
4. brevifolia *Sond.*	G	K	H	U
5. daphnoides *Lam.*	G	*	H	U
6. Dregeana *Scheele*	G	*	*	U
7. ericoides *Th.*	G	K	*	U
var. pachyphylla (*Prain*)	G	*	*	·
var. tenuis (*Sond.*)	*	K	·	U
8. heterophylla *Th.*	·	·	H	·
9. laxa *Eckl.*	*	K	H	·
10. marginata *E. Mey.*	*	K	*	·
11. polifolia *Jacq.*	G	K	H	U
12. pubescens *Th.*	G	*	*	·
13. pulchella *L.*	G	K	H	·
var. obtusata (*Sond.*)	·	·	H	·
14. rubricaulis *Eckl.*	G	K	H	·
var. grandifolia (*Prain*)	*	*	H	·
1, *and other spp., Oumeisieknie* (*K*).				
Croton L. (l.c. 410)				
1. rivularis *E. Mey.*	·	·	H	·
Ctenomeria Harv. (l.c. 500)				
1. capensis (*Th.*) *Harv.*	G	K	H	·
Dalechampia L. (l.c. 497)				
1. capensis *Spreng. f.*	·	·	H	·
Euphorbia L. (l.c. 222)				
1. clandestina *Jacq.*	G	·	·	·
2. Clava *Jacq.*	·	·	H	·
3. elliptica *Th.*	G	K	H	·
4. epicyparissias *E. Mey.*	G	K	H	·
5. ericoides *Lam.*	G	K	H	·
6. erythrina *Link*	G	*	H	U
7. fimbriata *Scop.*	·	·	H	·
8. genistoides *Berg.*	*	*	H	·
9. Gorgonis *Berger*	·	·	H	U
10. grandidens *Haw.*	·	·	H	·
11. Helioscopia *L.* †	*	K	·	·
12. heptagona *L.*	·	·	·	U
13. inermis *Mill.*	G	*	H	·
14. Kraussiana *Bernh.*	G	K	H	·
var. erubescens *N. E. Br.*	·	K	H	·
15. Ledienii *Berger*	·	·	H	·
16. mammillaris *L.*	G	*	H	·
17. mauritanica *L.*	G	*	H	U
18. Muirii *N. E. Br.*	G	·	·	·
19. Peplus *L.* †	G	K	H	·
20. polygona *Haw.*	·	·	H	U
21. pubiglans *N. E. Br.*	·	K	H	·

22. pugniformis *Boiss.*	*	K	*	·
23. rhombifolia *Boiss.*	·	·	H	·
var. cymosa (*N. E. Br.*)	G	*	H	U
24. submammillaris *Berger*	·	·	·	U
striata Th.	*	*	*	·
25. tetragona *Haw.*	·	·	H	·
26. triangularis *Desf.*	·	·	H	·
tuberculata Jacq.	*	*	*	·
10, 25, *Naaboom.* 15, *Suurnoorsdoring.* 17, *Geel melkbos.* 11, 19, *Spurge.*				
Jatropha L. (l.c. 418)				
1. capensis (*L.f.*) *Sond.*	·	·	H	·
Lachnostylis Turcz. (l.c. 383)				
1. hirta (*L.f.*) *Mull. Arg.*[1]	G	K	H	·
Koolhout.				
Leidesia Mull. Arg. (l.c. 462)				
obtusa (Th.) Mull. Arg.	*	*	*	·
1. procumbens (*L.*) *Prain*[2]	G	K	H	·
Phyllanthus L. (l.c. 386)				
1. heterophyllus *E. Mey.*	*	K	·	·
2. incurvus *Th.*	*	*	H	·
3. verrucosus *Th.*	·	·	H	·
Ricinus L. (l.c. 487)				
1. communis *L.* †	·	·	H	U
Kasterolieboom, Castor-oil plant.				
Sapium P. Browne				
1. Simii *O. Kze*	·	K	H	·
FLACOURTIACEAE. Fl. Cap. i, p. 65 (under Bixaceae)				
Dovyalis E. Mey. (l.c. 69)				
1. rotundifolia (*Th.*) *Harv.*	·	·	H	·
2. zizyphoides *E. Mey.*[3]	G	K	H	·
2, *Wijnbessie, Zuurbessie.*				
Kiggelaria L. (l.c. 71)				
1. africana *L.*[4]	G	K	H	U
Vaderlands Rooihout.				
Scolopia Schreb. (under **Phoberos** Lour., l.c. 67)				
1. Mundii (*Arn.*) *Warb.*[5]	*	K	H	·
2. Zeyheri (*Arn.*) *Szyszy.*[6]	·	K	H	U
1, *Klipdoring.* 2, *Wolwedoring, Thorn Pear.*				
FRANKENIACEAE. Fl. Cap. i, p. 113.				
Frankenia L. (l.c. 114)				
1. repens (*Berg.*)[7]	*	*	H	·
FUMARIACEAE. Fl. Cap. i, p. 15.				
Corydalis Medik. (under **Cysticapnos** Boerh., l.c. 16)				
1. vesicaria (*L.*) *Pers.*[8]	·	·	·	U

[1] L. capensis *Turcz.* [2] L. capensis *Mull. Arg.* [3] D. rhamnoides *Burch. & Harv.*
[4] Incl. K. Dregeana *Turcz.* [5] Phoberos Mundii *Arn.* [6] Phoberos Zeyheri *Arn.*
[7] F. capitata var. Nothria *Harv.* [8] Cysticapnos africana *Gaertn.*

Discocapnos Ch. & Schl. (l.c. 18)				
1. Dregei *Hutch.*[1]	·	K	H	·
Fumaria L. (l.c. 18)				
1. muralis *Sond.*[2] †	G	K	H	·
Phacocapnos Bernh. (under **Corydalis** Medic., l.c. 16)				
1. cracca (*Schl.*) *Bernh.*[3]	*	*	H	·
GENTIANACEAE. Fl. Cap. iv, s. i, p. 1056.				
Chironia L. (l.c. 1096)				
1. baccifera *L.*	G	K	H	U
2. emarginata *Jarosz.*	G	·	·	·
3. gracilis *Salisb.*	*	K	·	·
4. jasminoides *L.*	G	·	·	·
5. linoides *L.*	G	K	·	·
6. maritima *Eckl.*	*	K	H	·
7. melampyrifolia *Lam.*	G	K	H	·
8. peduncularis *Lindl.*	G	K	H	·
scabrida Gris. var. *liguliflora* (Prain)	*	*	*	·
9. serpyllifolia *Lehm. var.* microphylla (*Gris.*)	·	·	H	·
10. tetragona *L.f.*	G	K	H	·
var. linearis (*E. Mey.*)	*	K	H	U
Limnanthemum S. M. Gmel. (l.c. 1120)				
1. Thunbergianum *Griseb.*	*	K	H	U
Orphium E. Mey. (l.c. 1095)				
1. frutescens (*L.*) *E. Mey.*	·	·	·	U
Sebaea Soland. (l.c. 1057)				
1. acutiloba *Schinz*	·	K	*	·
2. aurea (*L.f.*) *R. Br.*	G	K	H	·
3. Brehmeri *Schinz.*	G	K	H	U
4. crassulaefolia *Ch. & Schl.*	·	K	*	·
5. Dregei *Schinz*	G	K	H	U
6. elongata *E. Mey.*	G	K	H	U
7. exacoides *Schinz*	·	K	·	·
8. fastigiata *A. W. Hill*	G	K	*	·
9. Grisebachiana *Schinz*	G	·	·	·
10. hymenosepala *Gilg*	·	·	H	·
11. minutiflora *Schinz*	*	*	H	·
12. sclerosepala *Gilg.*	G	·	·	U
13. Zeyheri *Schinz*	*	*	H	·
Villarsia Vent. (l.c. 1119)				
1. ovata (*L.f.*) *Vent.*	*	K	H	U
GERANIACEAE. Fl. Cap. i, p. 254.				
Erodium L'Her. (l.c. 258)				
1. moschatum *L'Hér.* †	*	K	H	U
Geranium L. (l.c. 257)				
1. caffrum	G	*	*	·

[1] D. Mundii var. Dregei *Harv.* [2] F. officinalis var. capensis *Harv.* [3] Corydalis Cracca *Schltdl.*

2. canescens L'Hér.[1]	G	K	H	·
3. incanum *L.*	G	K	H	·
4. ornithopodum E. & Z.	G	K	H	·
Monsonia *L.f.* (l.c. 254)				
1. ovata *Cav.*	G	K	H	U
Geita.				
Pelargonium L'Hér.				
1. abrotanifolium *Jacq.*	G	·	·	U
2. aconitophyllum (*E. & Z.*) *Harv.*	G	K	*	U
3. alchemilloides (*L.*) *Ait. var.* dentatum (*Harv.*)	G	K	·	·
var. aphanoides (*Harv.*)	*	K	·	·
var. ranunculifolium (*Harv.*)	·	·	H	U
4. barbatum *Jacq.*	·	·	H	·
5. betulinum *Ait.*[2]	G	K	·	·
6. bicolor *Ait.*	G	·	·	·
7. caffrum *E. & Z.*	·	K	*	U
8. candicans *Spreng.*	G	K	H	U
9. capitatum *Ait.*	G	K	H	·
10. carneum *Jacq.*	·	·	H	U
11. carnosum *Ait.*	G	·	·	U
12. caucalidifolium *Schltr.*	·	·	·	U
13. caucalifolium *Jacq.*	·	·	·	U
14. clavatum *L'Hér.*	G	·	·	·
15. convolvulifolium *Schltr.*	·	·	·	U
16. cordatum *Ait.*	G	K	H	U
17. denticulatum *Jacq.*	·	K	·	·
18. dichondraefolium *DC.*	·	·	·	U
19. dipetalum *L'Hér.*	*	K	·	·
20. divaricatum *Th. var.* glabrum (*Harv.*)	G	·	·	U
var. scabrum (*Harv.*)	G	·	·	U
21. elegans *Willd.*	·	·	H	·
22. ensatum *Th.*	G	*	H	U
23. exstipulatum *L'Hér.*	·	·	·	U
24. flavum *Ait.*	G	·	·	·
25. Gilgianum *Schltr.*	·	·	·	U
26. glutinosum *L'Hér.*	G	*	H	U
27. gracillimum *Fourc.*	·	·	·	U
28. graveolens *Ait.*[3]	G	·	·	U
29. grossularioides *Ait. var.* anceps (*Harv.*)	G	K	H	·
var. columbinum (*Harv.*)	·	K	H	·
var. iocastum (*Harv.*)	·	·	·	U
var. pubescens (*Harv.*)	G	·	·	·
30. heracleifolium *Lodd.*	*	K	H	·
31. hirsutum *Ait. var.* carneum (*Harv.*)	G	K	*	U
32. humansdorpense *R. Knuth*[4]	·	·	H	·
33. incisum *Willd.*	G	·	·	·

[1] Incl. G. knysnaense *R. Knuth.* [2] Incl. P. georgense *R. Knuth.*
[3] Incl. P. uniondalense *R. Knuth* (1930) *non R. Knuth* (1918).
[4] P. hermansdorpense *R. Knuth.*

34. inquinans *Ait.*	G	K	H	·
35. laevigatum *Willd.*	·	·	H	U
var. oxyphyllum (*Harv.*)	·	·	H	U
36. lobatum *Willd.*	G	K	H	·
37. longifolium *Jacq.*	*	K	*	U
38. mollicomum *Fourc.*	·	·	H	·
39. myrrhifolium *Ait.*	G	*	H	U
40. ochroleucum *Harv.*	G	·	·	·
41. odoratissimum *Ait.*	·	·	H	·
42. ovale *L'Hér.*	*	*	H	U
43. panduraeforme *E. & Z.*	·	·	H	·
44. Patersonii *R. Knuth*	·	·	·	U
45. patulum *Jacq.*	·	·	H	·
46. peltatum *Ait.*	*	K	H	U
47. populifolium *E. & Z.*	·	·	H	·
48. quercifolium *Ait.*	·	·	H	U
49. quinatum *Sims*[1]	·	·	H	·
51. Radula *Ait.*	G	K	*	·
52. radulaefolium *E. & Z.*	G	K	*	U
53. rapaceum *Jacq. var.* luteum (*Harv.*)	·	·	·	U
54. reniforme *Curt.*	*	K	H	U
55. ribifolium *Jacq.*	·	·	·	U
56. scabrum *Ait.*	G	*	H	U
57. schizopetalum *Sw.*	·	·	H	·
58. semitrilobum *Jacq. var.* Jacquini (*Harv.*)	*	*	H	·
var. adulterinum (*Harv.*)	·	·	H	·
59. senecioides *L'Hér.*	·	·	·	U
60. sidaefolium (*Th.*) *R. Knuth*[2]	·	·	·	U
61. tabulare (*L.*) *L'Hér.*	·	·	·	U
62. tetragonum *L'Hér.*	*	*	H	U
63. tripartitum *Willd.*	·	·	·	U
64. triste *Ait.*	·	·	·	U
65. uniondalense *R. Knuth*[3]	·	·	·	U
66. urbanum *E. & Z.*	·	·	H	·
67. violarium *Jacq.*[4]	G	·	·	·
68. vitifolium *Ait.*	*	K	H	·
69. zonale (*L.*) *Ait.*	*	K	H	U
GESNERIACEAE. Fl. Cap. iv, s. 2, p. 437.				
Streptocarpus Lindl. (l.c. 438)				
1. Rexii *Lindl.*	·	K	H	U
GOODENIACEAE. Fl. Cap. iii, p. 604.				
Scaevola L. (l.c. 604)				
1. Plumieri *Vahl*[5]	*	K	*	·

[1] Incl. P. Fourcadei *R. Knuth.* [2] P. reniforme var. sidaefolium *Harv.*

[3] *R. Knuth* (1918) *non R. Knuth* (1930). [4] P. tricolor *Curt.* [5] S. Thunbergii *E. & Z.*

GRUBBIACEAE. Fl. Cap. v, s. 2, p. 135 (under SANTALACEAE)				
Grubbia Berg.				
1. rosmarinifolia *Berg.*	G	K	H	U
2. stricta (*Lam.*) *A. DC.*	G	·	·	·
1, *Schilpadbos.*				
HALORRHAGIDACEAE. Fl. Cap. ii, p. 571.				
Gunnera L. (l.c. 571)				
1. perpensa *L.*	*	K	H	U
Ramenas.				
Laurembergia Berg., l.c. 572 (under **Serpicula** L.)				
1. repens *Berg.*[1]	G	K	H	U
Myriophyllum L.				
1. spicatum *L.* †	·	·	H	·
HAMAMELIDACEAE. Fl. Cap. ii, p. 324.				
Trichocladus Pers. (l.c. 324)				
1. crinitus (*Th.*) *Pers.*	G	K	H	·
2. ellipticus *E. & Z.*	·	·	H	·
Onderbos.				
HYPERICACEAE. Fl. Cap. i, p. 117.				
Hypericum L. (l.c. 117)				
1. aethiopicum *Th.*	·	K	H	U
2. Lalandii *Chois.*	G	K	H	U
ICACINACEAE. Fl. Cap. i, p. 235 (under OLACINEAE) and i, p. 473 (under AQUIFOLIACEAE)				
Apodytes E. Mey. (l.c. 235)				
1. dimidiata *E. Mey.*	G	K	H	U
Witpeer, White Pear.				
Cassinopsis Sond. (l.c. 473)				
1. ilicifolia (*Hochst.*) *O. Kze.*[2]	G	K	·	·
Lemoendoring.				
Pyrenacantha Wight				
1. scandens *Planch.*	G	K	H	·
LABIATAE. Fl. Cap. v, s. i, p. 226.				
Ballota L. (l.c. 368)				
1. africana *Benth.*	G	*	H	U
Leonotis Pers. (l.c. 374)				
1. dubia *E. Mey.*	·	·	·	U
2. Leonitis (*Willd.*) *R. Br.*[3]	G	K	H	U
3. Leonurus (*L.*) *R. Br.*	*	K	H	·
1, 2, 3, *Klipdagga, Wildedagga.*				
Marrubium L.				
1. vulgare *L.* †	·	·	·	U

[1] Serpicula repens *L.* [2] C. capensis *Sond.* [3] Incl. L. ovata *Spreng.*

Mentha L. (l.c. 303)				
1. aquatica *L.* .... †	*	K	H	·
2. longifolia *Huds.*, *s. sp.* capensis (*Briq.*)	G	*	*	U
3. viridis *L.* .... †	*	*	H	·
Wild mints.				
Plectranthus L'Hér. (l.c. 266)				
1. fruticosus *L'Hér.*[1]	G	K	H	·
2. hirtus *Benth.*	·	·	H	·
3. laxiflorus *Benth.*	·	·	H	·
4. spicatus *E. Mey.*	·	·	H	·
5. strigosus *Benth.*	·	K	H	·
6. verticillatus (*L.f.*) *Druce*[2]	·	K	H	U
1, *Muishondblaar.*				
Salvia L. (l.c. 307)				
1. aurea *L.*	*	K	H	·
2. aurita *L.f.*	G	K	H	·
3. clandestina *L. var.* angustifolia (*Benth.*)	G	*	*	U
4. disermas *L.*	·	·	·	U
5. Muirii *L. Bol. var.* grandiflora (*L. Bol.*)	G	·	·	·
6. repens *Burch.*	G	K	H	U
7. rugosa *Th.*	*	*	*	U
8. runcinata *L.f.*	*	*	H	·
9. scabra *L.f.*	·	·	H	·
10. triangularis *Th.*	G	K	H	·
Stachys L. (l.c. 336)				
1. aethiopica *L.*	G	K	H	U
2. arvensis *L.* .... †	*	*	H	·
3. Cooperi *Skan*	·	·	H	·
4. grandifolia *E. Mey.*	*	*	*	U
5. hispida (*Th.*) *Briq.*[3]	G	K	H	·
6. hispidula *Hochst.*	·	·	H	·
7. Priori *Skan*	·	·	H	·
8. scabrida *Skan*	·	·	·	U
9. serrulata *Burch.*	*	K	*	·
10. subsessilis *Burch.*	·	·	H	U
Teucrium L. (l.c. 384)				
1. africanun *Th.*	G	*	H	U
2. capense *Th.*	·	K	H	U
1, *Paddaklou.*				
LAURACEAE. Fl. Cap. v, s. i, p. 493.				
Cassytha L. (l.c. 500)				
1. ciliolata *Nees*	*	K	*	U
Ocotea Aubl.				
1. bullata (*Burch.*) *E. Mey.*	G	K	H	U
Stinkwood, Stinkhout.				

[1] Incl. Tyson 1765 placed under P. Krookii *Guerke* in Fl. Cap.

[2] P. Thunbergii *Benth.* [3] S. Thunbergii *Benth.*

LEGUMINOSAE. Fl. Cap. ii, p. 6.				
Acacia *Willd.*				
1. caffra *Th.*	·	·	H	·
2. Cyclops *A. Cunn.*	·	·	H	·
3. Karroo *Hayne*[1]	*	·	H	U
1, 3, *Doringboom.*				
Albizzia Durazzo				
1. lophantha *Benth.* †	*	*	H	·
Amphithalea E. & Z.				
1. micrantha *Walp.*	·	·	·	U
2. imbricata (*L.*) *Druce*[2]	*	K	·	·
3. intermedia *E. & Z.*	G	K	·	·
4. violacea (*E. Mey.*) *Benth.*	G	*	H	·
Argyrolobium E. & Z. (l.c. 67)				
1. collinum *E. & Z.*	*	K	H	U
2. crassifolium *E. & Z.*	·	·	H	·
3. incanum *E. & Z.*	G	*	H	U
4. molle *E. & Z.*	·	K	*	·
5. pauciflorum *E. & Z. var.* semiglabrum (*Harv.*)	G	*	*	·
6. pumilum *E. & Z. var.* verum (*Harv.*)	G	K	*	·
7. stenorrhizon *Oliver*	*	*	H	U
8. stipulaceum *E. & Z.*	·	K	*	·
9. tomentosum (*Andr.*) *Druce*[3]	·	K	H	·
10. trifoliatum (*L.*) *Druce*[4]	·	·	H	·
11. tuberosum *E. & Z.*	·	·	H	·
Aspalathus L. (l.c. 94)				
1. adelphea *E. & Z.*	·	K	H	U
2. affinis *Th.*	G	·	·	·
3. Alopecurus *Burch.*	G	K	·	·
4. argyrea *DC.*	G	*	*	U
5. asparagoides *L.*	G	K	H	·
6. astroites *L.*	*	*	H	U
7. batodes *E. & Z.*[5]	·	·	H	U
8. callosa *L.*	G	K	H	·
9. canescens *L.*	G	·	·	·
var. Bowieana *Benth.*	·	·	H	·
10. *sp.* (A. carinata *S. Garab. ms.*)	·	K	·	U
11. ciliaris *L.*	G	K	H	U
12. collina *E. & Z.*	G	*	H	U
13. dasyantha *E. & Z.*	*	K	·	U
14. diffusa *E. & Z.*	·	K	·	·
15. divaricata *Th. var.* subinermis (*Harv.*)	·	·	·	U
var. Thunbergii (*Harv.*)	*	*	H	·
16. ericifolia *L.*	G	·	·	·
17. Fourcadei *L. Bol.*	·	·	H	·
18. frankenoides *DC.*	·	K	*	U
var. chortophylla (*Harv.*)	·	K	H	·

[1] A. horrida Fl. Cap. [2] A. densa *E. & Z.* [3] A. sericeum *E. & Z.*
[4] A. Andrewsianum *Steud.* [5] A. aciphylla *Harv.*

19. glomerata *Benth.*	G	·	·	·
20. *sp.* (A. gracilis *S. Garab. ms.*)	G	K	·	U
21. hirta *E. Mey.*	G	·	·	U
22. hystrix *Th.*	G	K	·	U
23. incurvifolia *Walp.*	·	K	·	·
24. *sp.* (A. kougaensis *S. Garab. ms.*)	·	·	·	U
25. laricifolia *Berg.*	G	·	·	·
var. sericantha (*Harv.*)	·	·	H	·
26. longifolia *Benth.*	G	·	·	·
27. microdon *Benth.*	G	·	·	·
28. nigra *L.*	G	K	·	U
29. nivea *Th.*	·	·	H	·
30. obtusata *Th.*	·	·	·	U
31. pachyloba *Benth.*	*	K	·	·
32. pallescens *E. & Z.*	·	K	·	·
33. poliotes *E. & Z.*	G	K	H	U
34. retroflexa *L. var.* parviflora (*Harv.*)	G	·	·	·
35. rigescens *E. Mey.*	G	*	H	·
36. rubens *Th.*	G	*	H	U
37. rubrofusca *E. & Z.*[1]	G	*	*	U
38. sericea *Berg.*	G	·	·	·
39. setacea *E. & Z.*	G	K	H	·
40. spicata *Th.*	G	K	H	U
var. cephalotes (*Harv.*)	·	·	H	·
41. spinosa *L.*	G	K	H	U
42. suffruticosa *DC.*	G	K	H	U
43. teres *E. & Z.*	·	K	H	·
44. thymifolia *L.*	*	K	H	·
var. albiflora (*Harv.*)	·	·	·	U
45. vermiculata *Lam.*	G	·	·	U
46. virgata *Th.*	G	·	·	·
47. Wurmbeana *DC.*	·	K	·	·
Borbonia L. (l.c. 27)				
1. lanceolata *L.*	G	K	H	·
2. trinervia *Th.*	G	·	·	·
Cassia L.				
1. mimosoides *L.*	·	·	H	·
2. occidentalis *L.* †	·	K	H	·
3. tomentosa *L.f.* †	*	*	H	·
Crotalaria L. (l.c. 39)				
1. capensis *Jacq.*	*	K	*	·
2. obscura *DC.*	·	·	H	·
3. purpurea *Vent.*	G	K	H	·
3, *Red Keur.*				
Chrysoscias E. Mey., l.c. 247 (under **Rhynchosia** Lour.)				
1. argentea (*Th.*) *C. A. Smith*[2]	·	K	H	U
2. calycina *E. Mey.*[3]	G	K	H	·
3. erecta (*Th.*) *C. A. Smith*[4]	G	K	·	·
4. parviflora *E. Mey.*[5]	G	K	H	·

[1] Incl. A. Schlechteri *Bolus*. [2] Rhynchosia argentea *Harv.* [3] Rhynchosia leucoscias *Benth.* [4] Rhynchosia Chrysoscias *Benth.* [5] Rhynchosia microscias *Benth.*

Cyclopia *Vent.* (l.c. 6)				
1. aurea *Fourc.*	·	·	H	·
2. brachypoda (*Benth.*) *Hoffmeyr & Phillips var.* intermedia (*H. & P.*)[1]	·	·	·	U
3. subternata *Vog.*[2]	G	K	H	·
1, *Kouga Bush Tea.* 2, 3, *Bush Tea, Bossies tee.*				
Dolichos L. (l.c. 242)				
1. gibbosus *Th.*	G	K	H	·
2. hastaeformis *E. Mey.*	·	K	*	·
3. linearis *E. Mey.*	·	·	H	·
4. smilacinus *E. Mey.*	·	K	·	·
Dumasia DC. (l.c. 234)				
1. villosa *DC.*	·	K	·	·
Eriosema DC. (l.c. 258)				
1. squarrosum (*Th.*) *Walp.*	·	K	H	·
Erythrina L. (l.c. 236)				
1. caffra *Th.*	·	·	H	·
Kaffirboom.				
Fagelia Neck. (l.c. 247)				
1. bituminosa *DC.*	·	K	·	·
Indigofera L. (l.c. 163)				
1. angustata *E. Mey.*[3]	·	K	*	·
2. angustifolia *L.*	*	K	·	·
3. brachystachya *E. Mey.*	*	*	H	·
4. candicans *Ait.*	·	·	·	U
complicata E. & Z.	*	*	*	·
5. concava *Harv.*	G	·	·	U
6. declinata *E. Mey.*	G	K	·	U
7. denudata *Th.*	·	K	H	U
var. luxurians (*Harv.*)	·	·	H	·
var. spinosa (*Harv.*)	G	·	·	·
8. depressa *Harv.*	G	·	·	U
9. disticha *E. & Z.*	·	K	H	·
10. *sp.* (I. Duthiae *E. G. Baker ms.*) *Burch.* 5687	G	K	H	·
11. fastigiata *E. Mey.*	·	·	·	U
12. filifolia *Th.*	G	*	H	·
13. flabellata *Harv.*	G	K	·	U
14. glabella *Fourc.*	·	·	H	·
15. grisophylla *Fourc.*	·	·	H	·
16. heterophylla *Th.*	G	K	H	U
17. hispida *E. & Z.*	·	·	H	·
18. incana *Th.*	*	K	*	·
19. leptocarpa *E. & Z.*	·	·	H	U
20. mauritanica (*L.*) *Th.*[4]	G	K	H	U
var. cana (*Harv.*)	G	·	·	·
var. minor (*Harv.*)	G	*	H	·
21. monostachya *E. & Z.*	·	·	H	U

[1] C. Vogelii var. brachypoda *Harv.* [2] C. Vogelii var. subternata *Harv.*
[3] I. stenophylla *E. & Z.* (1836) *non Gill. & Perrottet* (1833). [4] I. coriacea *Ait.*

22. ovata *Th.*	G	·	·	U
23. Pappei *Fourc.*	·	·	H	U
24. poliotes *E. & Z.*	·	K	H	U
25. porrecta *E. & Z.*	·	K	H	·
26. rhodantha *Fourc.*	·	K	·	·
27. rigescens *E. Mey.*	·	·	·	U
28. sarmentosa *L.f.*	G	*	*	·
29. spinescens *E. Mey.*	·	·	·	U
30. stricta *L.f.*	G	K	H	U
31. sulcata *DC.*	·	K	H	U
32. tomentosa *E. & Z.*	·	·	H	·
33. Zeyheri *Spreng.*	*	K	H	·
var. leptophylla (*Harv.*)	·	·	H	·
Lebeckia Th. (l.c. 82)				
1. cuspidosa (*DC.*) *Druce*[1]	·	·	·	U
2. mucronata *Benth.*	·	·	·	U
3. pauciflora *E. & Z.*	G	*	H	U
Plukenetiana E. Mey.	*	*	*	·
4. pungens *Th.*	·	·	·	U
5. sepiaria *Th.*	G	K	*	·
Lessertia DC. (l.c. 213)				
annularis Burch.	*	*	*	·
1. brachystachya *DC.*	*	K	*	·
2. linearis (*Th.*) *DC.*	G	*	*	U
3. physodes *E. & Z.*	G	*	H	·
4. stenoloba *E. Mey.*	·	K	H	·
var. obtusata (*Harv.*)	·	·	H	·
Loddigesia Sims (l.c. 82)				
1. oxalidifolia *Sims.*	G	K	H	·
Lotononis E. & Z.				
1. azurea (*E. & Z.*) *Benth.*	·	·	H	·
debilis (E. & Z.) Benth.	*	*	*	·
2. flava *Dummer*	·	K	·	·
3. laxa *E. & Z.*	·	K	*	·
4. prostrata (*L.*) *Benth.*	·	·	H	·
pumila E. &. Z.	*	*	*	·
pungens E. & Z.	*	*	*	·
5. umbellata (*L.*) *Benth.*	G	·	·	·
Medicago L. (l.c. 162)				
1. Aschersoniana *Urban* †	·	K	·	U
2. hispida *Gaertn. var.* denticulata (*Willd.*)[2] †	*	K	*	·
laciniata Allm. †	*	*	*	·
3. sativa *L.* †	*	*	*	U
2, *Bur clover.* 3, *Lucerne.*				
Melilotus Juss. (l.c. 161)				
1. parviflora *Desf.* †	*	K	H	·
Stinkklaver.				

[1] L. psiloloba *Walp.* [2] M. denticulata *Willd.*

Melolobium E. & Z. (l.c. 78)				
1. adenodes *E. & Z.*	·	·	·	U
2. candicans *E. & Z.*	·	·	·	U
3. microphyllum (*Th.*) *E. & Z.*	*	*	H	·
Podalyria Lam. (l.c. 9)				
1. biflora *Lam.*	G	·	·	·
2. Burchellii *DC.*	G	K	H	U
calyptrata Willd.	*	*	*	·
3. cuneifolia *Vent.*	G	K	H	·
4. glauca *DC.*	G	K	H	U
5. myrtillifolia *DC.*	*	K	H	·
Priestleya DC. (l.c. 15)				
1. angustifolia *E. & Z.*	*	*	H	·
2. hirsuta (*Th.*) *DC.*	G	K	H	U
3. sericea *E. Mey.*	·	K	·	·
Psoralea L. (l.c. 143, incl. **Hallia** Th., l.c. 231)				
1. affinis *E. & Z.*[1]	*	G	H	·
2. alata (*Th.*) *Salter*[2]	*	K	*	·
3. asarina (*Th.*)[3]	*	K	*	·
4. axillaris *L.f.*	G	K	H	U
5. bracteata *L.*	G	K	H	·
6. candicans *E. & Z.*	·	·	H	U
7. capitata *L.f.*	G	K	H	U
8. cordata (*L.*) *Salter*[4]	G	K	H	·
9. decidua *Berg.*[5]	G	·	·	·
10. decumbens *Ait.*	*	K	H	·
11. heterosepala *Fourc.*	·	·	H	·
12. Keetii *Schonl.*	·	K	·	·
laxa Salter [5a]	*	*	*	·
13. oligophylla *E. & Z.*	G	*	H	·
14. pinnata *L.*	G	K	H	U
var. glabra (*Harv.*)	·	·	·	U
var. speciosa (*Harv.*)	·	·	H	·
var. vulgaris (*Harv.*)	G	·	H	·
15. polysticta *Benth.*	·	K	·	·
16. polyphylla *E. & Z.*[6]	·	K	H	U
17. racemosa *Th.*	G	*	H	U
18. repens *L.*	*	*	H	·
19. restioides *E. & Z.*	*	K	·	·
20. sericea *Poir.*[7]	G	K	H	·
21. spicata *L.*	G	K	H	·
22. tenuifolia L.[8]	·	·	·	U
triantha E. Mey.	*	*	*	·
23. verrucosa *Willd.*	*	*	H	U
11, *Ploukeur.*				

[1] P. pinnata var. subglabra *Harv.* [2] Hallia alata *Th.* [3] Hallia asarina *Th.*
[4] Hallia cordata *L.* [5] P. aphylla *L.* [5a] Hallia virgata *Th. non* Psoralea virgata *Nuttall*.
[6] P. carnea *H. M. L. Forbes non E. Mey.* [7] P. tomentosa *Th.* [8] P. fascicularis *DC.*

Rafnia Th. (l.c. 31)				
1. axillaris *Th.*	G	K	H	·
2. elliptica *Th.*	·	K	H	U
3. triflora *Th.*	*	K	H	·
Rhynchosia Lour. (l.c. 247)				
1. adenodes *E. & Z.*	G	K	*	·
2. capensis (*Burm.*) *Schinz*[1]	G	K	H	U
3. caribaea (*Jacq.*) *DC.*[2]	G	K	H	U
4. ciliata (*Th.*) *Schinz*[3]	·	·	H	U
5. ferulaefolia *Benth.*	G	·	·	·
6. Harmsiana *Schltr. var.* Burchellii (*Burtt-Davy*)	·	K	H	·
7. hirsuta *E. & Z.*	·	K	*	·
8. sericea *E. & Z.*[4]	·	K	H	·
9. Totta (*Th.*) *DC.*	·	·	H	·
Schotia Jacq. (l.c. 273)				
1. latifolia *Jacq.*	G	K	*	U
2. speciosa *Jacq.*	·	·	H	·
1, *Bos Boerboen.* 2, *Boerboen.*				
Sutherlandia R. Br. (l.c. 212)				
1. frutescens (*L.*) *R. Br.*	G	K	H	U
Gansies, Cancer bush.				
Tephrosia Pers. (l.c. 203)				
1. capensis (*Th.*) *Pers. var.* angustifolia (*Harv.*)	G	K	H	·
var. hirsuta (*Harv.*)	G	K	H	·
var. Jacquini (*Harv.*)	·	·	H	U
2. grandiflora (*Vahl*) *Pers.*	*	*	H	·
Trifolium L. (l.c. 158)				
1. Burchellianum *Ser.*	*	K	H	·
2. procumbens *L.* †	*	*	H	·
3. repens *L.* †	*	*	H	·
stipulaceum Th.	*	*	*	·
1, *Cape Clover.* 2, *Hop-clover.* 3, *White clover.*				
Vicia L. (l.c. 233)				
1. angustifolia *Roth*[5] †	·	·	H	U
2. tetrasperma (*L.*) *Moench* †	G	K	*	U
1, *Common vetch, Tares.*				
Vigna Savi (l.c. 239)				
1. debilis *Fourc.*	·	·	H	·
2. helicopus (*E. Mey.*) *Walp.*[6]	·	K	*	·
3. vexillata (*L.*) *Benth.*	·	K	H	·
Virgilia Lam. (l.c. 266)				
1. oroboides (*Berg.*) *Salter*[7]	G	K	H	U
Keurboom.				
Wiborgia Th. (l.c. 90)				
1. fusca *Th.*	G	·	·	·
Zornia Gmel. (l.c. 225)				
1. bracteata *Gmel.*[8]	·	·	H	·

[1] R. glandulosa *DC.* [2] R. gibba *E. Mey.* [3] R. puberula *Harv.*
[4] R. Orthodanum *Benth.* = R. sordida (*E. Mey.*) *Schinz.* [5] Vicia sativa *L.*
[6] V. luteola *Benth.* [7] V. capensis *Lam.* [8] Z. tetraphylla *Michx.*

LENTIBULARIACEAE. Fl. Cap. iv, s. 2, p. 423.				
Utricularia L. (l.c. 423)				
1. capensis *Spreng.*[1]	G	*	H	U
2. exoleta *R. Br.*	·	K	*	
stellaris L.f.	*	*	*	
Bladderworts.				
LINACEAE. Fl. Cap. i, p. 308.				
Linum L. (l.c. 309)				
1. africanum *L.*	G	K	H	U
2. quadrifolium *L.*	*	*	*	U
3. thesioides *Bartl.*	G	*	H	U
4. Thunbergii *E. & Z.*	G	K	*	·
Wild flax.				
LOGANIACEAE. Fl. Cap. iv, s. i, p. 1036.				
Buddleia L. (l.c. 1045)				
1. pulchella *N. E. Br.*	·	K	·	·
2. salvifolia *Lam.*	G	K	H	·
2, *Saliehout.*				
Chilianthus Burch. (l.c. 1042)				
1. lobulatus *Benth.*	·	·	·	U
2. oleaceus *Burch.*[2]	G	K	H	U
2, *Saliehout.*				
Lachnopylis Hochst. (under **Nuxia** Lam., l.c. 1038)				
1. floribunda (*Benth.*) *C. A. Smith*[3]	G	K	H	U
Vlier.				
Strychnos L. (l.c. 1050)				
1. decussata (*Pappe*) *Gilg.*[4]	·	K	H	·
Kajatenhout.				
LORANTHACEAE. Fl. Cap. ii, p. 574, and v, s. 2, p. 100.				
Loranthus L. (l.c. v, s. 2, 121)				
1. elegans *Ch. & Schl.*	G	·	·	
Viscum L. (l.c. v, s. 2, 121)				
1. capense *L.f.*	G	K	H	U
2. obscurum *Th.*	G	K	H	·
3. rotundifolium *L.f.*	*	K	H	·
Mistel, Mistletoe.				
LYTHRACEAE. Fl. Cap. ii, p. 515.				
Lythrum L. (l.c. 516) †	*	K	H	·
1. hyssopifolium *L.*				
Nesaea *Comm.* (*l.c.* 217)				
1. sp.	·	·	H	·

[1] Incl. U. Ecklonii *Spreng.* [2] Chilianthus arboreus *A. DC.* [3] Nuxia floribunda *Benth.* [4] S. Atherstonei *Harv.* [5] Fide Phillips in Gen. S. Afr Pl. p. 433.

MALVACEAE. Fl. Cap. i, p. 157.				
Abutilon Gaertn. (l.c. 168)				
1. indicum (*L.*) *Sweet*	·	K	H	·
2. Sonneratianum (*Cav.*) *Sweet*	G	K	H	U
Hibiscus L. (l.c. 170)				
1. aethiopicus *L.*	G	K	H	U
2. diversifolius *Jacq.*	*	K	H	·
3. gossypinus *Th.*	·	·	H	·
4. Ludwigii *E. & Z.*	·	K	*	·
5. pedunculatus *L.f.*	G	K	*	·
6. pusillus *Th.*	.	.	H	.
7. Trionum *L.*	G	K	H	U
4, *Roostou.* 7, *Black-eyed Susan.*				
Malva L. (l.c. 159)				
1. parviflora *L.* †	*	*	*	U
Kiesieblaar.				
Malvastrum A. Gray (l.c. 159)[1]				
1. Burchellii *Bak. f.*	·	K	·	·
2. calycinum (*Th.*) *Gürke*	*	*	H	·
3. capense (*Cav.*) *Gray & Harv.*[2] *var.* balsamicum (*Harv.*)	G	K	H	U
4. deflexum (*Turcz.*) *Stapf.*[3]	G	·	·	U
5. tridactyles (*Th.*) *Gray & Harv.*	G	·	·	·
6. trilobatum *Bak. f.*	G	·	·	·
7. virgatum (*Cav.*) *Gray & Harv.*	·	·	·	·
var. angustifolia (*Harv.*)[4]	·	K	H	U
var. Dilleniana (*Harv.*)	·	·	H	U
var. oblongifolia (*Harv.*)	G	K	H	·
Pavonia *Cav.*				
1. Meyeri (*Muell.*) *Mast.*[5]	·	K	*	·
2. praemorsa (*L.f.*) *Cav.*	·	·	H	·
Sida L. (l.c. 166)				
1. triloba *Cav.*	·	K	H	·
Sphaeralcea St. Hil. (l.c. 165)				
spp. from Natal to Cape fide Phillips Gen. S.A. Pl.	*	*	*	·
MELIACEAE. Fl. Cap. i, p. 244, and under AITONIAE, l.c. 243				
Ekebergia Sparm. (l.c. 247)				
1. capensis *Sparm.*	G	K	H	·
Essenhout.				
Nymania Lindb. (under **Aitonia** L.f. l.c. 243)				
1. capensis (*Th.*) *Lindb.*[6]	·	·	H	U
Chinese lanterns.				
Ptaeroxylon E. & Z. (l.c. 243)				
1. obliquum (*Th.*) *Radlk.*[7]	·	·	H	·
Sneezewood, Nieshout.				

[1] This genus requires revision. [2] M. scabrosum *Stapf.* [3] M. grossulariaefolium *Gray & Harv.*
[4] M. angustifolium *Stapf non Cav.* [5] P. mollis *E. Mey. non HBK.*
[6] Aitonia capensis *L.f.* [7] P. utile *E. & Z.*

Trichilia L. (l.c. 247)				
1. Ekebergia *E. Mey.*	·	K	*	·
Essenhout.				
MELIANTHACEAE. Fl. Cap. i, p. 366.				
Melianthus L. (l.c. 367)				
1. comosus *Vahl*	·	·	H	U
2. major L.	*	*	H	·
Kruidjie-roer-my-niet.				
MENISPERMACEAE. Fl. Cap. i, p. 69.				
Antizoma Miers (l.c. 11)				
1. capensis (*L.f.*) *Diels*[1]	*	K	H	·
Davidjes.				
Cissampelos L. (l.c. 10)				
1. torulosa *E. Mey.*	G	K	H	·
MORACEAE. Fl. Cap. v, s. 2, p. 522.				
Ficus L. (l.c. 523)				
1. Burtt-Davyi *Hutch.*	*	K	H	·
2. capensis *Th.*	·	K	H	·
1, *Veld Wild Fig.* 2, *Wild Fig, Kooman.*				
MYOPORACEAE. Fl. Cap. v, s. i, p. 92.				
Oftia Adans. (l.c. 93)				
1. africana (*L.*) *Bocq.*	·	·	·	U
MYRICACEAE. Fl. Cap. v, s. ii, p. 561.				
Myrica L. (l.c. 562)				
1. Burmanni *E. Mey.*	G	K	H	·
2. conifera *Burm. f.*	*	K	H	U
3. cordifolia *L.*	G	K	H	·
4. Dregeana *A. Chev.*	G	K	*	·
5. elliptica *A. Chev.*	G	·	·	·
6. glabrissima *A. Chev.*	G	*	*	U
7. humilis *Ch. & Schl.*	*	*	H	·
8. myrtifolia *A. Chev.*	·	K	H	·
9. ovata *Wendl. f.*	G	K	H	U
10. quercifolia *L.*	G	K	H	·
3, *Waxberry, Wasbessie.*				
MYRSINACEAE. Fl. Cap. iv, s. i, p. 431.				
Myrsine L.				
1. africana *L.*	*	K	H	·
Rapanea Aubl. (under **Myrsine** L., l.c. 434)				
1. Gilliana (*Sond.*) *Mez*[2]	·	K	H	·
2. melanophloeos (*L.*) *Mez*[3]	G	K	H	U
2, *Beukenhout.*				

[1] Cissampelos capensis *L.f.* [2] Myrsine Gilliana *Sond.* [3] Myrsine melanophloeos *R. Br.*

NYMPHAEACEAE. Fl. Cap. i, p. 13.				
Nymphaea L.				
1. capensis *Th.*[1]	*	K	H	·
Blue Water-lily.				
OCHNACEAE, Fl. Cap. i, p. 448.				
Ochna Schreb. (l.c. 448)				
1. arborea *Burch.*	·	K	H	·
2. atropurpurea *DC.*	·	K	·	·
1, *Rooihout.*				
OLEACEAE. Fl. Cap. iv, s. i, p. 478.				
Jasminum L. (l.c. 479)				
1. angulare *Vahl*	·	·	H	·
2. glaucum (*L.f.*) *Ait.*	*	*	*	U
3. tortuosum *Willd.*	·	·	H	·
Wild jasmines.				
Olea L. (l.c. 485)				
1. capensis *L.*	*	K	H	·
2. exasperata *Jacq.*	*	K	H	·
3. foveolata *E. Mey.*	G	K	H	·
4. laurifolia *Lam.*	G	K	H	U
5. verrucosa *Link.*	*	K	H	U
1, *Bastard Ironwood, Baster Ysterhout.* 3, *Fynblaar Ysterhout.* 4, *Black Ironwood, Ysterhout.* 5, *Swart Oliwenhout.*				
OLINIACEAE. Fl. Cap. ii, p. 519.				
Olinia Th. (l.c. 519)				
1, cymosa (*L.f.*) *Th.*	G	K	H	·
Hard Pear, Harde Peer.				
ONAGRACEAE. Fl. Cap. ii, p. 503.				
Epilobium L. (l.c. 505)				
1. flavescens *E. Mey.*	·	·	·	U
2. hirsutum *L.* †	*	K	H	U
3. neriophyllum *Hausskn.*[2]	*	*	*	U
Ludwigia L. (l.c. 504)				
palustris Ellm.	*	*	*	·
Oenothera L. (l.c. 505)				
1. nocturna *Jacq.* †	*	K	H	U
2. ordorata *Jacq.* †	*	K	*	·
3. striata *Led.* †	·	·	H	·
Evening primroses.				
Xylopleurum Spach				
1. roseum (*Ait.*) *Raim.* †	·	·	H	·
OROBANCHACEAE. Fl. Cap. iv, s. 2, p. 421.				
Orobanche L. (l.c. 421)				
1. ramosa *L.*	·	·	·	U

[1] N. stellata Fl. Cap, *non Willd.* [2] E. tetragonum Fl. Cap. *non L.*

OXALIDACEAE. Fl. Cap. i, p. 312.				
Oxalis L. (l.c. 313)				
bifurca Lodd.	*	*	*	·
1. capillacea *E. Mey. var.* glabra (*Sond.*)	*	*	H	·
2. caprina *L.*	*	*	H	U
3. ciliaris *Jacq.*[1]	G	K	H	U
4. corniculata *L. var.* repens (*Zucc.*)[2]	G	K	H	·
5. duriuscula *Schltr.*	·	K	·	U
6. Eckloniana *Presl. var.* Sonderi (*Salter*)[3]	*	K	·	·
7. Fergusoniae *Salter*	*	*	H	U
8. Fourcadei *Salter*	·	·	H	U
9. georgica *Bol. f.*[9]	G	K	H	U
10. glabra *Th.*	G	*	H	·
11. goniorhiza *E. & Z.*	*	*	H	·
imbricata E. & Z.	*	*	*	·
12. inops *E. & Z.*[4]	*	K	H	·
13. incarnata *L.*	*	K	H	·
14. lanata *L.f.*	*	*	H	·
15. obtusa *Jacq.*	*	*	H	·
16. pendulifolia *Salter*	G	K	·	·
17. pes-caprae *L.*[5]	G	*	*	·
18. polyphylla *Jacq.*	G	*	H	·
19. psilopoda *Turcz.*[10]	.	.	.	U
20. punctata *L.f.*	G	*	H	U
21. purpurea *Jacq.*[6] *var.* alba[7]	·	K	H	·
22. Smithiana *E. & Z.*[8]	·	K	H	·
23. stellata *E. & Z. var.* violacea (*Sond.*)	G	*	H	U
var. gracilior (Salter)	G	·	·	·
Bowiei Lindl.	*	*	*	.
PAPAVERACEAE. Fl. Cap. i, p. 14.				
Argemone L.				
1. mexicana *L.* †	·	·	H	U
Mexican Poppy.				
Papaver L. (l.c. 15)				
1. aculeatum *Th.*	G	*	H	·
Wild Poppy, Wilde Papaver.				
PASSIFLORACEAE. Fl. Cap. ii, p. 498.				
Passiflora L.				
1. caerulea *L.* †	·	K	H	·
2. quadrangularis *L.* †	·	K	H	·
1, *Passion Flower.* 2, *Granadilla.*				

[1] Incl. O. Mundii *Sond.* and O. georgensis *R. Knuth* [2] O. repens *Th.*
[3] Incl. O. Bolusii *R. Knuth* [4] O. convexula *Sond. non Jacq.* [5] O. cernua *Th.*
[6] = O. variabilis *Jacq.* [7] O. breviscapa *Jacq.* [8] O. Smithii *Sond.*
[9] O. vestita *R. Knuth* [10] O. sublanata *R. Knuth*

PENAEACEAE. Fl. Cap. v, s. 2, p. 81.				
Endonema A. Juss. (l.c. 96)				
Thunbergii A. Juss.	*	*	*	·
Penaea L. (l.c. 82)				
1. acutifolia *A. Juss.*	G	K	·	·
2. Cneorum *E. Mey.*	*	*	*	U
3. mucronata *L.*	*	K	*	·
4. myrtifolia *Endl.*	G	K	H	U
5. myrtoides *L.f.*	G	K	H	·
6. ovata *E. & Z.*	G	K	H	U
PHYTOLACCACEAE. Fl. Cap. i, p. 151, i, p. 149, and v, s. i, p. 454.				
Adenogramma Reich. (l.c. i, 149)				
1. galioides *Fenzl*	*	K	H	·
sylvatica Fenzl	*	*	*	·
Limeum L. (l.c. i, 152)				
1. aethiopicum *Burm.*	G	*	H	U
2. capense *Th.*	·	·	·	U
Phytolacca L. (l.c. v, s. i, 456)				
1. americana *L.* †	G	K	·	·
PIPERACEAE. Fl. Cap. v, s. i, p. 487.				
Peperomia Ruiz & Pavon (l.c. 489)				
1. reflexa (*L.f.*) *A. Dietr.*	·	K	H	·
2. retusa (*L.f.*) *A. Dietr.*	G	K	H	·
Piper L. (l.c. 488)				
1. capense *L.f.*	G	K	H	·
Bospeper, Wild Pepper.				
PITTOSPORACEAE. Fl. Cap. i, p. 443.				
Pittosporum Banks				
1. viridiflorum *Sims.*	G	K	H	·
PLANTAGINACEAE. Fl. Cap. v, s. i, p. 387.				
Plantago L. (l.c. 388)				
1. capillaris *E. Mey.*	·	·	·	U
2. carnosa *Lam.*	*	*	H	U
3. lanceolata *L.* †	·	K	H	·
4. litoraria *Fourc.*	·	·	H	·
5. major *L.* †	*	*	H	·
6. virginica *L.* †	·	·	H	·
Plantains. 3, *Narrow-leaved plantain.*				
PLUMBAGINACEAE. Fl. Cap. iv, s. i, p. 418.				
Limonium Mill. (under **Statice** Willd., l.c. 419)				
1. linifolium (*L.f.*) *O. Kze.*[1]	*	K	*	·
2. scabrum (*Th.*) *O. Kze.*[2]	*	K	H	·

[1] Statice linifolia *L. f.* [2] Statice scabra *Th.*

Plumbago L. (l.c. 424)				
1. capensis *Th.*	G	K	H	·
POLYGALACEAE. Fl. Cap. i, p. 79.				
Mundia Knuth (l.c. 95)				
1. spinosa *DC.*	*	*	H	U
Muraltia Neck. (l.c. 95)				
1. alopecuroides (*L.*) *DC. var.* latifolia (*Harv.*)	G	·	·	U
var. typica (*Harv.*)	*	K	H	·
2. anthospermifolia *E. & Z.*	G	K	·	U
Beiliana Harv.	*	*	*	·
3. ciliaris *DC.*	G	K	*	·
4. Cynara *Chod.*	G	·	·	·
depressa Burch.	*	*	*	·
5. ericaefolia *DC.*	·	K	H	U
6. ericoides *Chod.*	G	·	·	·
7. exappendiculata *Chod.*	G	·	·	·
8. filiformis *Th.*	G	K	.	U
9. Heisteria (*L.*) *DC.*	*	*	*	U
10. incompta *E. & Z.*	G	·	·	·
11. juniperifolia *DC.*	·	·	H	U
12. macroceras *DC.*	*	*	H	·
13. mixta L.[1]	G	*	H	·
14. ononidifolia *E. & Z.*	G	*	*	·
15. pauciflora (*Th.*) *DC.*	G	·	·	·
16. phylicoides *Th.*	G	·	·	·
17. rubeacea *E. & Z.*	G	·	·	U
18. satureoides *Burch.*	*	K	·	·
19. serpylloides *DC.*	G	·	·	·
20. squarrosa (*Th.*) *DC.*	G	*	H	U
var. ruscifolia (*E. & Z.*)[2]	·	K	H	·
21. stipulacea (*L.*) *DC.*	G	K	·	·
Polygala L. (l.c. 80)				
1. affinis *DC.*	·	·	·	U
2. bracteolata *L.*	G	K	H	·
3. ericaefolia *DC.*	*	K	H	U
4. Garcini *DC.*	G	K	·	·
5. hispida *Burch*	G	K	H	·
6. hottentotta *Presl*	.	K	*	·
7. imbricata *Hayek*[3]	·	K	*	·
8. latifolia *Ker.*[4]	·	K	·	·
9. macra *DC.*[5]	*	K	H	U
10. myrtifolia *L.*	G	K	H	U
var. amoena (*Harv.*)	·	K	H	U
var. ligularis (*Harv.*)	·	·	H	·
var. natalensis (*Harv.*)	·	·	H	·
11. oppositifolia *L.*	·	·	·	U

[1] M. mitior (*Berg.*) *Levyns ms.* [2] M. ruscifolia *E. & Z.*
[3] P. oppositifolia var. cordata *Chod.* [4] P. oppositifolia var, latifolia *Harv.*
[5] As Penther 1510 (K) Galpin 3751 (H).

12. peduncularis *Burch.*	·	K	·	·
13. pinifolia *Lam.*	·	·	·	U
14. pubiflora *Burch.*	*	K	·	·
15. refracta *Burch.*	*	K	H	U
16. rhombifolia *E. & Z.*[1]	·	·	H	·
17. tetragona *Burch.*[2]	G	K	H	U
18. triquetra *Presl.*	G	K	H	·
19. virgata *Th.*	*	*	H	U
var. speciosa (*Harv.*)	G	·	·	U
10, *Langelier.*				
POLYGONACEAE. Fl. Cap. v, s. i, p. 459.				
Emex Neck. (l.c. 481)				
1. australis *Steink.*	*	K	H	U
Dubbelje.				
Polygonum L. (l.c. 463)				
acuminatum Knuth var. *capense* (Meisn.)	*	*	*	·
1. aviculare *L.* †	*	K	H	·
Convolvulus L. †	*	*	*	·
2. glutinosum *Wall. var.* capense (*Meisn.*)	·	K	*	·
3. lapathifolium *Ait.*, *s.sp.* maculatum (*Dyer & Trim.*)	*	K	*	U
4. salicifolium *Braun*[3]	G	K	*	·
5. serrulatum *Lag.* †	*	K	H	·
6. tomentosum *Willd.*	G	K	H	·
7. undulatum *Berg.*[4]	*	*	H	U
Rumex L. (l.c. 472)				
1. Acetosella L. †	*	K	H	·
2. conglomeratus *Murr.* †	G	·	·	·
3. Ecklonianus *Meisn.*	*	K	H	U
4. lativalvis *Meisn. var.* acetosoides (*Meisn.*)	·	·	·	U
5. pulcher *L.* †	*	K	H	·
6. sagittatus *Th.*	G	K	H	·
7. sarcorhizus *Link.*[5]	*	K	*	·
1, *Steenbok Suuring, Sheep's Sorrel.* 2, 3, *Docks.* 6, *Rooi Suuring.*				
PORTUCALACEAE. Fl. Cap. ii, p. 381.				
Anacampseros Sims (l.c. 382)				
1. arachnoides (*Haw.*) *Sims*	G	*	*	U
filamentosa (Haw.) Sims	*	*	*	·
2. lanceolata (*Haw.*) *DC.*	·	·	·	U
Portulaca L. (l.c. 381)				
1. oleacera *L.* †	*	*	H	·
Purslane.				
Portulacaria Jacq. (l.c. 385)				
1. afra *Jacq.*	·	·	H	·
Spekboom.				

[1] P. oppositifolia var. rhombifolia *Harv.* [2] P. oppositifolia var. cuspidata *Harv.*
[3] P. senegalense *Meisn.* [4] P. atraphaxoides *Th.* [5] R. cordatus *Desf.*

PRIMULACEAE. Fl. Cap. iv, s. i, p. 426.				
Anagallis L. (l.c. 428)				
1. arvensis *L.* †	G	K	H	·
2. caerulea *Schreb.* †	G	*	H	·
3. Huttoni *Harv.*	G	·	·	U
1, *Scarlet pimpernel.* 2, *Blue pimpernel.*				
Lysimachia L. (l.c. 427)				
1. nutans *Nees.*	·	·	H	·
Samolus L. (l.c. 430)				
1. porosus *Th.*	G	K	H	·
2. Valerandi *L.* †	*	K	H	·
PROTEACEAE. Fl. Cap. v, s. i, p. 502.				
Aulax Berg.				
1. pinifolia *Berg.*	G	K	·	U
Diastella Knight (l.c. 650)				
1. thymelaeoides (*Berg.*) *Hutch.*[1]	*	K	·	·
Faurea Harv. (l.c. 639)				
1. Macnaughtonii *Phillips*	·	K	·	·
Terblans.				
Hakea Schrad.				
1. acicularis *Knight* †	G	K	H	·
2. suaveolens †	·	·	H	·
Leucadendron Berg. (l.c. 509)				
1. album (*Th.*) *Fourc.*[2]	G	·	·	U
2. aemulum *R. Br.*	*	K	·	U
3. concolor *R. Br.*	*	*	*	U
4. decurrens *R. Br.*	G	·	·	·
5. eucalyptifolium *Buek.*	G	K	H	U
6. glabrum *R. Br.*	G	·	·	U
7. grandiflorum *R. Br.*	*	K	*	·
8. laureolum (*Lam.*) *Fourc.*[3]	G	K	H	·
9. Meyerianum *Buek.*	G	K	·	·
10. pallens (*L.*) *Druce*[4]	G	K	*	U
11. parviflorum (*L.*) *Druce*[5]	·	·	H	U
12. Phillipsii *Hutch.*	·	K	H	U
13. pubescens *R. Br.*	·	·	H	U
14. ramosissimum *Buek.*	G	*	H	U
salignum R. Br.	*	*	*	·
15. scabrum *R. Br.*	·	·	·	U
16. sorocephalodes *Phill. & Hutch.*	·	·	·	U
17. strictum *R. Br.*	G	*	*	·
18. uliginosum *R. Br.*	G	K	H	U
5, *Geelbos.*				
Leucospermum R. Br. (l.c. 610)				
1. conocarpodendron (*L.*) *Buek.*[6]	G	·	·	·
2. cordifolium (*Knight*) *Fourc.*[7]	G	·	·	·

[1] D. bryiflora *Knight.* [2] L. aurantiacum *Buek.* [3] L. decorum *R. Br.* [4] L. adscendens *R. Br.* [5] L. plumosum *R. Br.* [6] L. conocarpum *R. Br.* [7] L. nutans *R. Br.*

3. ellipticum (*Th.*) *R. Br.*[1]	G	K	H	U
4. glabrum *Phillips*	G	K	·	·
5. grandiflorum (*Salisb.*) *R. Br.*	G	K	·	·
6. royenifolium *Stapf*	G	*	H	U
Mimetes Salisb. (l.c. 643)				
1. cucullata (*L.*) *R. Br.*[2]	*	K	·	·
2. hirta (*L.*) *Knight*	*	K	·	·
3. pauciflora *R. Br.*	G	K	·	U
4. splendida *Knight*	G	K	·	·
Paranomus Knight (under **Nivenia** R. Br., l.c. 708)				
1. candicans (*Th.*) *O. Kze.*[3]	·	·	·	U
2. reflexus (*Phill. & Hutch.*) *N. E. Br.*[4]	·	K	H	·
Protea L. (l.c. 552)				
acaulis Th.	*	*	*	·
1. canaliculata *Haw.*	·	·	·	U
2. compacta *R. Br.*	G	*	*	·
3. cynaroides *L.*	G	K	H	·
4. eximia (*Knight*) *Fourc.*[5]	G	K	H	U
5. grandiceps *Tratt*	*	K	·	·
6. humiflora *Andr.*	G	·	·	·
7. incompta (*Knight*) *R. Br.*	G	*	H	·
8. lacticolor *Salisb.*	G	*	*	·
9. laevis *R. Br.*	*	K	·	U
10. longiflora *Lam.*	G	K	*	·
11. longifolia *Andr.*	G	·	·	·
lorifolia (Knight) Fourc.[6]	*	*	*	·
12. mellifera *Th.*	*	*	H	U
13. Mundii *Kl.*	*	K	H	U
14. neriifolia *R. Br.*	G	K	H	U
15. nitida *Mill.*[7]	G	*	H	U
repens Th.	*	*	*	·
16. scabra *R. Br.*	·	·	·	U
17. tenax *R. Br.*	·	·	H	U
3, *Mountain Rose.* 12, *Suikerbos.* 15, *Waboom.*				
Serruria Salisb. (l.c. 654)				
1. acrocarpa *R. Br.*	*	K	·	·
2. Burmanni *R. Br.*	G	·	·	·
Spatalla Salisb.				
1. barbigera *Knight*	G	·	·	·
2. bombycina *Knight*	G	·	·	·
3. Burchellii *Phillips*	G	·	·	·
4. parilis *Knight*	*	K	·	·
5. sericea *R. Br.*	G	·	·	U
RAFFLESIACEAE. Fl. Cap. v, s. i, p. 485.				
Cytinus L.				
sanguineus (Th.) Fourc.[8]	*	*	*	·
Aardroos.				

[1] L. attenuatum *R. Br.* [2] M. lyrigera *Knight.* [3] Nivenia mollissima *R. Br.*
[4] Nivenia reflexa *Phill. & Hutch.* [5] P. latifolia *R. Br.* [6] P. macrophylla *R. Br.*
[7] P. grandiflora *Th.* [8] C. dioicus *Juss.*

RANUNCULACEAE. Fl. Cap. i, p. 1.				
Anemone Hall (l.c. 3)				
1. capensis *L.*	G	*	H	·
Clematis L. (l.c. 1)				
1. brachiata *Th.*	·	K	H	·
2. incisodentata *A. Rich.*	G	·	·	·
3. Thunbergii *Steud.*	G	K	·	·
Traveller's Joy.				
Knowltonia Salisb. (l.c. 4)				
1. brevistylis *Szyszyl.*	·	K	·	·
2. capensis (*L.*) *Huth.*[1]	·	·	·	U
3. canescens *Szyszyl.*	·	K	·	·
4. filia *Dur. & Schinz*[2]	G	·	·	U
5. glabricarpellata *Huth*	·	K	H	·
6. rigida *Salisb.*	*	K	H	·
var. ternata (*Harv.*)	·	·	H	·
7. rotundifolia *Huth*	G	*	*	·
8. vesicatoria (*L.f.*) *Curtis*	G	K	H	·
8, *Brandblaaren.*				
Ranunculus Hall (l.c. 5)				
1. pubescens *Th.*[3]	G	K	H	·
var. Harveyanus (*Burtt-Davy*)[4]	G	*	H	·
Boterblom, Buttercup.				
RESEDACEAE. Fl. Cap. i, p. 63.				
Oligomeris Camb. (l.c. 64)				
1. dipetala (*Ait.*) *Mull. Arg.*[5]	G	·	·	U
2. capensis *Th. var.* virgata (*Harv.*)	·	·	·	U
RHAMNACEAE. Fl. Cap. i, p. 475.				
Phylica L. (l.c. 479)				
1. abietina *E. & Z.*	·	·	H	·
2. alba *Pillans*	·	·	·	U
3. axillaris *Lam.*	.	K	·	·
var. microphylla (*Pillans*)[6]	G	K	H	U
var. gracilis (*Pillans*)	·	·	H	·
var. pulchra (*Pillans*)	·	K	·	U
var. maritima (*Pillans*)	*	K	·	·
4. confusa *Pillans*	·	·	H	U
5. debilis *E. & Z. var.* Fourcadei (*Pillans*)	·	·	H	·
6. curvifolia (*Presl.*) *Pillans*[7]	G	K	·	·
7. Dodii *N. E. Br.*[8]	*	K	·	·
ericoides L.	*	*	*	.
8. Fourcadei *Pillans*	G	*	H	U
9. gnidioides *E. & Z.*	·	·	H	·
10. imberbis *Berg.*[9]	G	·	·	·
var. eriophora (*Pillans*)	G	·	·	·

[1] K. hirsuta *DC.* [2] K. daucifolia *DC.* [3] R. pinnatus *Harv.* [4] R. plebeius *Harv.*
[5] O. Dregeana *Presl.* [6] P. villosa var squarrosa *Harv. & Sond.* [7] P. re[illegible]inata *Bernh.*
[8] P. pubescens var. brachycephala *Sond.* [9] P. eriophoros var. imberbis *Sond.*

11. karroica *Pillans*	G	·	·	U
12. Keetii *Pillans*	·	K	·	U
var. mollis (*Pillans*)	·	·	·	U
13. lachnaeoides *Pillans*	G	*	H	U
14. litoralis *D. Dietr.*[1]	·	K	H	·
15. paniculata *Willd.*	G	K	H	U
16. parviflora *Berg.*	*	K	·	·
17. pinea *Th.*[2]	G	K	H	·
18. purpurea *Sond.*	G	K	H	U
var. floccosa (*Schltr.*)	G	K	H	·
var. Pearsonii (*Pillans*)	·	·	·	U
19. stipularis *L.*	G	K	·	·
20. Willdenowiana *E. & Z.*	G	*	H	·
Noltea Reich. (l.c. 478)				
1. africana (*L.*) *Reich.*	*	*	H	·
Rhamnus L. (l.c. 476)				
1. prinoides *L'Hér.*	G	K	H	·
Honderpis, Blinkblaar.				
Scutia Comm. (l.c. 477)				
1. myrtina (*Burm.*) *Kurz*[3]	G	K	H	·
Wag-'n-bietje, Katdoorn.				
ROSACEAE. Fl. Cap. ii, p. 285.				
Agrimonia L. (l.c. 290)				
1. Eupatoria *L. var.* capensis (*Harv.*)	G	K	*	·
Akkermonie (*K*).				
Alchemilla L. (l.c. 291)				
1. capensis *Th.*	G	K	H	U
Cliffortia L. (l.c. 292, and H. Weimarck, Mon. of the gen. Cliffortia)				
1. Burchellii *Stapf*	G	K	H	U
2. drepanoides *E. & Z.*	·	·	H	·
3. eriocephalina *Cham.*	*	K	·	·
4. falcata *L.f.*	*	K	·	·
5. ferruginea *L.f.*	*	K	H	·
6. filicaulis *Schldl.*	*	K	H	·
var. octandra (*H. Weim.*)	*	K	·	·
7. filifolia *L.f.*	*	K	·	·
8. graminea *L.f.*	G	K	H	U
9. ilicifolia *L.*	G	K	H	U
10. linearifolia *E. & Z.*	·	K	H	·
11. odorata *L.f.*	G	K	H	·
12. paucistaminea *H. Weim.*	G	K	H	·
13. pterocarpa *H. Weim.*[4]	G	·	·	·
14. ramosissima *Schltr.*	*	*	H	·
15. ruscifolia *L.*	G	*	H	·
16. serpyllifolia *Ch. & Schl.*	*	K	·	U
17. stricta *H. Weim.*	G	K	H	U

[1] P. atrata *Licht.* var. litoralis *Sond.* [2] P. purpurea var. reclinata *Sond.*
[3] S. Commersoni *Brongn.* [4] C. juniperina var. pterocarpa *Harv.*

18. strobilifera *Murr.*	G	K	H	U
8, *Wilde ertjes.* 15, *Steekbos.* 18, *Kammie.*				
Grielum L. (l.c. 304)				
1. tenuifolium *L.*	*	*	H	·
Pygeum Gaertn.				
1. africanum *Hook. f.*	·	K	·	·
Red Stinkwood, Nuwehout.				
Rubus L. (l.c. 286)				
1. fruticosus *L.* †	G	K	·	·
2. pinnatus *Willd.*	*	K	H	·
3. rigidus *Sm.*	G	K	*	·
Blackberries, Brambles, Brame.				
RUBIACEAE. Fl. Cap. iii, p. i.				
Anthospermum L. (l.c. 26)				
1. aethiopicum *L.*	G	K	H	·
var. montanum (*E. & Z.*)	·	K	H	·
var. tenuifolium (*Cruse*)	·	·	H	·
2. ciliare *L. var.* glabrifolium (*Sond.*)	*	K	H	U
3. herbaceum *L.f.* [1]	G	K	H	·
4. paniculatum *Cruse*	G	K	H	·
1, *Kattestert.*				
Burchellia R. Br. (l.c. 2)				
1. bubalina (*L.f.*) *Sims* [2]	G	K	H	·
Wilde granaat, Buffelshoring, Wild Pomegranate.				
Canthium Lam. (l.c. 16, and under **Plectronia** L., l.c. 17)				
1. Mundianum *Ch. & Schl.* [3]	*	K	H	·
2. obovatum *Kl.*	·	K	H	·
3. pauciflorum (*Kl.*) [4]	·	K	*	·
4. spinosum (Kl.) *O. Kze.* [5]	·	·	H	·
5. ventosa (L.) *Sp. Moore* [6]	*	K	H	·
1, *Klip Ess.* 2, *Quar.* 5, *Bokdrol, Schaapdrolletjes.*				
Carpacoce Sond. (l.c. 2)				
1. spermacocea (*Reich.*) *Sond.*	*	K	H	·
2. vaginellata *Salter*	*	K	H	·
Galium *Scop.*				
1. capense *Th.*	G	*	H	U
2. glabrum *Th.*	*	K	H	·
tomentosum Th. [7]	*	*	*	·
Gardenia Ellis (l.c. 4)				
1. capensis (*Montin*) *Druce* [8]	·	·	H	·
Galopina Th. (l.c. 26)				
1. circaeoides *Th.*	*	K	H	·
Hydrophylax L.f. (l.c. 25)				
1. carnosa (*Hochst.*) *Sond.*	·	·	H	·
Nenax Gaertn. (under **Ambraria** Cruse, l.c. 33)				
1. acerosa *Gaertn.* [9]	·	K	·	·

[1] A. lanceolatum *Th.* [2] B. capensis *R. Br.* [3] Plectronia Mundiana *Pappe.*
[4] Plectronia pauciflora *Kl.* [5] Plectronia spinosa *Kl.* [6] Plectronia ventosa *L.*
[7] Incl. G. asperum *Th.* [8] G. Thunbergia *L.f.* [9] Ambraria acerosa *Sond.*

Oldenlandia L. (under **Hedyotis** Lam., l.c. 8)				
capensis Th.[1]	*	*	*	·
Psychotria L. (under **Grumilea** *Gaertn.*, l.c. 21)				
1. capensis (*Eckl.*) *Vatke*[2] *Lemoenhout.*	·	K	*	·
Rothmannia *Th.* (under **Gardenia** Ellis, l.c. 4)				
1. capensis *Th.*[3] *Wilde Katjiepiering.*	G	K	H	·
Rubia L. (l.c. 34)				
1. petiolaris *DC.*	·	K	H	·
Sherardia L.				
1. arvensis *L.* †	·	·	H	·
RUTACEAE. Fl. Cap. i, p. 369.				
Acmadenia Bartl. & Wendl.				
1. alternifolia *Ch. & Schl.*	*	K	·	·
2. barosmoides *Dümmer*	·	·	·	U
3. densifolia *Sond.*	·	·	H	·
4. gracilis *Dümmer*	*	*	H	·
5. juniperina *Bartl. & Wendl.*[4]	*	K	*	·
6. tetragona *Bartl. & Wendl.*	G	·	·	·
7. n. sp. (*Laughton s.n.*)	·	·	H	·
Adenandra *Willd.* (l.c. 384)				
1. Kraussii *Meisn.*	G	·	·	·
Agathosma Willd. (l.c. 399)				
1. acutissima *Dümmer*	·	·	H	·
2. apiculata *G. F. W. Meyer*	·	K	H	·
3. blaerioides *Ch. & Schl.*	G	K	·	U
4. capensis *Dümmer*[5]	G	*	H	U
5. cerefolium (*Vent.*) *Bartl. & Wendl.*	G	·	·	·
6. chortophylla *E. & Z.*	*	*	H	U
var. ciliolata (*Sond.*)	G	*	H	·
7. ciliata (*L.*) *Link*	G	·	·	·
8. cryptocarpa *Fourc.*	·	·	H	·
8. Dielsiana *Schltr.*	G	·	·	·
9. ericoides *Schldl.*	G	*	H	·
var. glabrata (*Sond.*)	·	·	H	·
10. fastigiata *E. & Z.*	·	·	·	U
11. hirta (*Lam.*) *Bartl. & Wendl.*	*	*	H	·
12. Keetii *Dümmer*	·	K	·	·
13. lanceolatum (*L.*) *Engler*[6]	G	·	·	·
14. marifolia *E. & Z.*	G	·	·	·
15. Martiana *Sond.*	·	·	H	·
16. microphylla *E. Mey.*	G	K	H	·
17. mucronulata *Sond.*	·	·	·	U
18. Muirii *Phillips*	·	·	·	U
19. Niveni *Sond.*	G	*	H	·

[1] Hedyotis capensis *Lam.* [2] Grumilea capensis *Sond.*
[3] Gardenia Rothmannia *L. f.* [4] Macrostylis Patersoniae *Schonl.*
[5] A. erecta *Bartl. & Wendl.* [6] A. rugosa *Link.*

20. phylicoides *Fourc.*	·	·	H	·
21. platypetala *E. & Z.*	G	·	·	·
22. puberula (*Steud.*) *Fourc.*[1]	G	*	H	·
23. pubescens *Sond.*	G	K	·	·
24. punctata *Sond.*	·	·	H	·
25. Rehmanniana *Dümmer*	G	·	·	·
26. serpyllacea *Licht.*	·	·	·	U
27. sessilipetala *Dümmer*	G	K	·	·
28. Sonderiana *Dümmer*	G	*	H	·
29. spinosa *Sond.*	·	·	·	U
30. stenopetala *Steud.*[2]	·	·	H	·
31. Taskerae *Dümmer*	G	·	·	U
32. variabilis *Sond.*	·	·	·	U
33. sp. (*Laughton s.n.*)	·	·	H	·
16, *Steenbokbuchu.*				
Barosma Willd. (l.c. 392)				
1. lanceolata (*Th.*) *Sond.*	G	K	H	U
var. obtusifolia (*Sond.*)	·	·	H	·
2. microcarpa *Sond.*	G	*	H	·
3. ovata (*Th.*) *Bartl. & Wendl.*	G	K	*	U
4. oblonga (*Th.*) *E. & Z.*	G	·	·	U
5. pulchella (*L.*) *Bartl. & Wendl.*	G	*	*	·
6. scoparia *Bartl. & Wendl.*	G	K	H	U
7. unicarpellata *Fourc.*	·	·	H	·
8. venusta *E. & Z.*	·	·	H	·
Calodendrum *Th.* (l.c. 371)				
1. capense *Th.*	·	K	H	·
Wild Chestnut, Wilde Kastaiing.				
Citrus L.				
1. medica *L.* †	G	K	H	·
Wild Lemon.				
Clausena Burm. (under **Myaris** Presl, l.c. 444)				
1. inaequalis (*Spreng.*) *Benth.*[3]	G	K	H	·
Perdepis.				
Coleonema Bartl. & Wendl.				
1. pulchrum *Hook. f.*	*	*	H	·
2. rubrum (*Berg.*) *Druce*[4]	*	*	H	·
2, *Cape May.*				
Diosma L. (l.c. 373)				
1. oppositifolia *L.*[5]	*	K	H	U
2. ramosissima *Bartl. & Wendl.*	·	·	H	U
Empleurum Soland.				
1. unicapsularis (*Th.*) *Druce*[6]	G	K	H	U
Olifantsbuchu, Berg buchu.				
Fagara L. (under **Xanthoxylon** L., l.c. 445)				
1. capensis *Th.*[7]	G	K	H	·
2. Davyi *Verdoorn*	·	K	H	·
1, 2, *Perdepram, Knobwood.*				

[1] A. gnidioides *Schldl.* [2] A. filipetala *E. & Z.* [3] Myaris inaequalis *Presl.*
[4] C. album *Bartl. & Wendl.* [5] Diosma vulgare *Schldl.* [6] E. serrulatum *Ait.*
[7] Xanthoxylon capense *Harv.* and X. Thunbergii *DC.*

Macrostylis Bartl. & Wendl. (l.c. 439)				
1. villosa (*Th.*) *Sond.*	*	K	·	·
Vepris Comm. (l.c. 447)				
1. lanceolata *G. Don*[1]	G	K	*	·
White Ironwood, Wit Ysterhout.				
SALICACEAE. Fl. Cap. v, s. 2, p. 575.				
Salix L. (l.c. 575)				
1. fragilis *L.* †	G	·	·	·
2. mucronata *Th.*[2]	*	*	H	U
2, *Wilgeboom, Cape Willow.*				
SALVADORACEAE. Fl. Cap. iv, s. 1, p. 488.				
Azima Lam. (l.c. 489)				
1. tetracantha *Lam.*	·	·	H	·
SAMYDACEAE. Fl. Cap. i, p. 65 (under BIXACEAE)				
Trimeria Harv.				
1. rotundifolia (*Hochst.*) *Gilg.*[3]	G	K	H	U
2. trinervis *Harv.*	·	·	H	·
1, *Wilde Moerbei.*				
SANTALACEAE. Fl. Cap. v, s. 2, p. 135.				
Osyris L. (l.c. 208)				
1. abyssinica *Hochst.*[4]	G	K	H	U
Nantekara, Pruimbas.				
Rhoiacarpos A. DC. (l.c. 207)				
1. capensis (*Harv.*) *A. DC.*	*	*	H	·
Pruimbas.				
Thesidium Sond. (l.c. 201)				
1. fragile (*Th.*) *Sond.*	*	*	H	U
2. leptostachyuum (*A. DC.*) *Sond.*	·	K	·	·
3. microcarpum (*A. DC.*) *A. DC.*[5]	*	*	H	U
4. podocarpum (*A. DC.*) *A. DC.*[6]	*	K	*	·
Thesium L. (l.c. 136)				
1. acutissimum *A. DC.*	·	K	H	·
2. aggregatum *A. W. Hill*	·	·	H	·
3. asperifolium *A. W. Hill*	G	*	*	·
4. capitatum *A. W. Hill*	*	*	H	·
5. commutatum *Sond.*	*	*	H	·
6. cuspidatum *A. W. Hill*	·	K	·	·
7. ericaefolium *A. DC.*	G	K	H	·
8. euphorbioides *Berg.*	*	*	H	·
9. flexuosum *A. DC.*	*	*	H	U
10. foliosum *A. DC.*	·	K	H	U
11. Frisea *L.*	*	K	·	U
12. funale *L.*	G	*	H	U

[1] Toddalia lanceolata *Lam.* [2] Salix capensis *Th.* in Fl. Cap. [3] T. alnifolia *Planch.* [4] O. compressa *A. DC.* [5] T. exocarpaeoides *Sond.* [6] T. Thunbergii *Sond.*

13. galioides *A. DC.*	*	*	*	U
14. glomeratum *A. W. Hill*	·	·	·	U
15. glomeruliflorum *Sond.*	*	*	H	·
16. gnidiaceum *A. DC. var.* Zeyheri (*Sond.*)	·	K	H	·
17. junceum *Bernh.*	*	*	H	U
micropogon A. DC.	*	*	*	·
18. nigromontanum *Sond.*	G	K	H	·
19. paronychioides *Sond.*	G	K	·	·
20. penicillatum *A. W. Hill*[1]	G	*	H	U
21. phyllostachyum *Sond.*	*	*	*	U
22. scabrum *L.*	*	*	H	·
23. scandens *E. Mey.*	·	·	·	U
24. Sonderianum *Schltr.*	G	·	·	·
spicatum L.	*	*	*	·
25. squarrosum *L.f.*	*	K	H	·
26. strictum *Berg.*	G	*	H	U
27. subnudum *Sond.*	G	K	H	U
28. triflorum *Th.*	·	·	H	·
29. umbelliferum *A. W. Hill*	·	·	H	·
30. virgatum *Lam.*	G	K	H	U
SAPINDACEAE. Fl. Cap. i, p. 236.				
Allophylus L. (under **Schmidelia** L, l.c. 238)				
1. decipiens (*Arn.*) *Radlk.*[2]	·	K	H	·
Atalaya Baillon				
1. capensis *R. A. Dyer*	·	·	H	·
Dodonaea L. (l.c. 241)				
1. angustifolia *Th.*[3]	·	K	H	U
Ysterhoutbos.				
Hippobromus E. & Z. (l.c. 241)				
1. pauciflorus (*L.*) *Radlk.*[4]	·	·	H	·
Baster Perdepis.				
Pappea E. & Z. (under **Sapindus** L, l.c. 240)				
1. capensis *E. & Z.*[5]	·	·	H	U
Bergpruim, Kambessie.				
Smelophyllum Radlk. (under **Sapindus** L., l.c. 240)				
1. capense (*Sond.*) *Radlk.*[6]	·	·	H	U
Buig-mij-niet.				
SAPOTACEAE. Fl. Cap. iv, s. i, p. 436.				
Sideroxylon L. (l.c. 438)				
1. inerme *L.*	G	K	H	·
Wit Melkhout, White Milkwood.				
SAXIFRAGACEAE. Fl. Cap. ii, p. 305.				
Montinia L.f. (l.c. 307)				
1. caryophyllacea *Th.*[7]	G	K	H	·

[1] Incl. T. helichrysoides *A. W. Hill.* [2] Schmidelia decipiens *Arn.* [3] D. Thunbergiana *E. & Z.* [4] H. alata *E. & Z.* [5] Sapindus Pappea *Sond.* [6] Sapindus capensis *Sond.* [7] Montinia acris *L.f.*

SCROPHULARIACEAE. Fl. Cap. iv, s. 2, p. 121.				
Aptosimum Burch. (l.c. 125)				
1. depressum (*L.f.*) *Burch.* C	G	·	·	U
Karroo Violet.				
Bellardia Allm. (l.c. 419)				
Trixago (L.) Allm.	*	*	*	·
Buchnera L. (l.c. 391)				
1. dura *Benth.*	*	K	H	·
simplex (Th.) Druce[1]	*	*	*	·
Cycnium E. Mey. (l.c. 395)				
1. sp.	·	K	·	·
Diascia Link & Otto (l.c. 139)				
Bergiana Link & Otto	*	*	*	·
elongata Benth.	*	*	*	·
1. Engleri *Diels* C	·	·	·	U
2. patens (*Th.*) *Grant.*[2]	·	·	·	U
3. Pentheri *Schltr.*	G	·	·	·
4. *sp. F.* 4723 (D. longipedunculata *Grant ms.*) .. C	G	·	·	·
Diclis Benth. (l.c. 200)				
1. reptans *Benth.*	G	K	H	U
2. ovata *Benth.*	·	·	H	·
Freylinia Pangelli (l.c. 214)				
1. oppositifolia *Spin.*[5]	*	*	*	U
2. undulata *Benth*	G	K	H	U
Graderia Benth. (under **Bopusia** Presl, l.c. 388)				
1. scabra *Benth.*[3]	*	K	H	·
Halleria L. (l.c. 207)				
1. elliptica *Th.*	*	K	*	U
2. lucida *L.*	*	K	H	U
2, *Nutzung.*				
Harveya Hook. (l.c. 400)				
1. Bolusii *O. Kze.*	*	*	*	U
2. capensis *Hook.*	*	K	H	U
3. coccinea *Schltr.*	*	*	H	·
4. hyobanchoides *Schltr.*	·	·	H	·
5. laxiflora *Hiern*	*	*	H	·
pauciflora (Benth.) Hiern	*	*	*	·
6. purpurea (*L.f.*) *Harv.*	*	K	H	U
7. speciosa *Bernh.*	·	·	H	·
8. tubulosa *Harv.*	*	*	H	·
2, *White Harveya.*				
Hemimeris L.f. (l.c. 164)				
1. montana *L.*	*	K	*	·
Hyobanche L. (l.c. 415)				
1. glabrata *Hiern*	G	*	*	U
2. sanguinea *L.*	G	*	H	·
Ilysanthes Benth. (l.c. 363				
1. dubia (*L.*) *Barnhart*[4]	*	K	H	U

[1] B. glabrata *Benth.* [2] D. monasca *Hiern.* [3] Bopusia scabra *Presl.* [4] I. riparia *Rufin.*
[5] F. lomceolata *G.Don.*

Limosella L. (l.c. 356)				
1. aquatica *L.*	*	*	H	U
var. tenuifolia (*Hook. f.*)	·	·	H	·
2. capensis *Th.*	G	*	*	·
3. grandiflora *Benth.*	·	·	H	·
Manulea L. (l.c. 221)				
Benthamiana Hiern	*	*	*	·
1. Cheiranthus *L.*	*	K	H	·
2. laxa *Schltr.*	G	·	·	·
3. leiostachys *Benth.*	*	K	*	·
4. obovata *Benth.*	·	·	H	·
5. parviflora *Benth.*	·	·	·	U
Melasma Berg. (l.c. 371)				
1. capense (*Th.*) *Hiern*	*	*	H	·
2. luridum (*Harv.*) *Hiern.*	*	*	H	·
3. scabrum *Berg.*	*	K	H	U
4. sessiliflorum (*Vahl*) *Hiern*	G	K	H	·
Nemesia Vent. (l.c. 169)				
1. affinis *Benth.*	*	*	H	U
2. capensis (*Th.*) *O. Kze.*[1]	*	*	H	·
var. linearis (*Vent.*) *Grant*	G	*	H	U
3. denticulata (*Benth.*) *Grant*[2]	·	·	H	U
4. divergens *Benth.*	*	K	*	·
5. floribunda *Lehm.*	*	K	*	U
6. lucida *Benth.*	*	K	·	·
7. melissaefolia *Benth.*	·	·	H	·
8. pubescens *Benth.*	G	·	·	·
9. versicolor *E. Mey.*	G	K	H	·
10. *sp. F.* 1594 (N. elata *Grant ms.*)	G	*	*	·
11. *sp. F.* 1415 (N. Fourcadei *Grant ms.*)	·	·	H	·
Polycarena Benth. (l.c. 321, and under **Phyllopodium** Benth., l.c. 311)				
1. bracteata (*Benth.*) *Levyns*[3]	G	*	H	·
capillaris (L.f.) Benth.	*	*	*	·
capitata (L.f.) Levyns[4]	*	*	*	·
2. cuneifolia (*L.f.*) *Levyns*[5]	·	K	H	·
3. diffusa (*Benth.*) *Levyns*[6]	G	*	H	·
4. linearifolia *Bol.*) *Levyns*[7]	G	·	·	U
5. multifolia (*Hiern*) *Levyns*[8]	G	·	·	·
Ramphicarpa Benth. (l.c. 398)				
1. tubulosa (*L.f.*) *Benth.*	G	K	*	·
Sopubia Hamilt. (l.c. 385)				
1. simplex *Hochst.*	·	·	H	·
Striga Lour. (l.c. 379)				
1. Thunbergii *Benth.*	·	·	K	·
Sutera Roth (l.c. 243)				
1. aethiopica (*L.*)	*	K	H	·

[1] N. foetens *Vent.* [2] Diascia denticulata *Benth.* [3] Phyllopodium bracteatum *Benth.* [4] Phyllopodium capitatum *Benth.* [5] Phyllopodium cuneifolium *Benth.* [6] Phyllopodium diffusum *Benth.* [7] Phyllopodium linearifolium *Benth.* [8] Phyllopodium multifolium *Hiern.*

2. affinis (*Bernh.*) *O. Kze.*		*	K	·	·
3. aspalathoides (*Benth.*) *Hiern*		*	K	H	U
4. atrocoerulea *Fourc.*		·	·	H	·
var. latifolia (*Fourc.*)		·	·	H	U
5. atropurpurea (*Benth.*) *Hiern*	C	G	*	*	U
6. caerulea (*L.f.*) *Hiern*		G	K	H	U
7. campanulata (*Benth.*) *O. Kze.*		*	K	H	·
8. cordata (*Th.*) *O. Kze.*		G	K	H	·
9. denudata (*Benth.*) *O. Kze.*		·	·	H	U
10. hispida (*Th.*)[1]		·	·	H	U
11. integrifolia (*L.f.*) *O. Kze.*		G	K	H	U
12. Kraussiana (*Bernh.*) *Hiern*		·	·	·	·
var. latifolia (*Hiern*)		·	·	H	U
13. linifolia (*Th.*) *O. Kze.*		G	K	H	U
14. marifolia (*Benth.*) *O. Kze.*		·	·	·	U
15. microphylla (*L.f.*) *Hiern*		*	*	H	·
16. pedunculata (*Andr.*) *Hiern*		G	K	H	U
17. phlogiflora (*Benth.*) *Hiern*		G	*	*	·
18. pinnatifida (*Benth.*) *Hiern*		·	·	·	U
19. polyantha (*Benth.*) *O. Kze.*		·	K	H	·
20. racemosa (*Benth.*) *O. Kze.*		·	K	*	·
21. revoluta (*Benth.*) *O. Kze.*		G	·	·	U
22. roseo-flava *Hiern.*		·	·	H	·
23. stenophylla *Hiern*		G	·	·	·
24. tenuifolia (*Berh.*)		G	K	·	U
Teedia Burch. (l.c. 210)					
1. lucida (*Ait.*) *Rudolphi*		G	K	H	U
2. pubescens *Burch.*		·	·	H	U
Verbascum L. (l.c. 137)					
1. virgatum *Stokes*	†	·	K	·	·
Veronica Tourn. (l.c. 367)					
1. agrestis *L.*	†	G	·	·	·
2. Anagallis *L.*	†	*	*	H	U
3. Chamaedrys *L.*	†	G	·	·	·
4. serpyllifolia *L.*	†	G	·	·	·
Zaluzianskya F. W. Schmidt (l.c. 333)					
1. africana (*Th.*) *Hiern*		*	*	H	·
2. capensis *Walp.*		*	K	H	U
dentata (Benth.) Walp.		*	*	*	·
3. divaricata (*Th.*) *Walp.*		G	·	·	·
longiflora (Benth.) Walp.		*	*	*	·
lychnidea (D. Don) Walp.		*	*	*	·
4. maritima (*L.f.*) *Walp.*		*	K	H	·
5. peduncularis (*Benth.*) *Walp.*	C	·	·	·	U
SELAGINACEAE. Fl. Cap. v, s. i, p. 95.					
Dischisma Choisy (l.c. 111)					
1. ciliatum (*Berg.*) *Choisy*		G	K	*	·
2. erinoides (*L.f.*) *Sweet*		*	K	H	·

[1] S. brachiata *Roth.*

Hebenstreitia L. (l.c. 96)					
1. cordata *L.*		*	K	*	·
dentata L.		*	*	*	·
2. integrifolia *L.*		G	K	H	U
3. lanceolata (*E. Mey.*) *Rolfe*		·	K	·	·
4. scabrida *Burm.*[1]		*	*	H	·
Selago L. (l.c. 129)					
1. adpressa *Choisy*		G	·	·	U
aspera Choisy		*	*	*	·
2. brevifolia *Rolfe*		·	·	·	U
3. Burchellii *Rolfe*		G	K	·	·
canescens L.f.		*	*	*	·
4. corymbosa *L.*		G	K	H	U
5. diffusa *Th.*	C	·	·	·	U
6. diosmoides *Rolfe*		·	·	·	U
7. Dregei *Rolfe*		G	K	H	·
8. Forbesii *Rolfe*		·	K	H	·
9. fruticosa *L.*		*	K	*	·
glabrata Choisy		*	*	*	·
10. glomerata *Th.*		G	K	H	U
11. herbacea *Choisy*		*	*	H	·
12. linearis *Rolfe*		G	·	·	U
13. luxurians *Choisy*		G	*	H	·
14. polystachya *L.*		G	·	·	·
15. pubescens *Rolfe*		G	·	·	·
16. ramulosa *E. Mey.*		G	*	H	·
17. serrata *Berg.*		*	K	·	·
18. spinea *Link*	C	·	·	·	U
19. spuria *L.*		G	K	H	U
20. Thunbergii *Choisy*		G	K	H	U
21. villicaulis *Rolfe*		·	K	H	·
Walafrida E. Mey. (l.c. 116)					
1. ciliata (*L.f.*) *Rolfe*		G	K	·	·
2. cinerea (*L.f.*) *Rolfe*		G	K	*	U
3. densiflora *Rolfe*		·	·	H	·
4. diffusa (*Hochst.*) *Rolfe*		·	·	H	·
5. geniculata (*L.f.*) *Rolfe*		G	*	H	·
6. gracilis *Rolfe*		G	·	·	U
7. micrantha (*Choisy*) *Rolfe*		*	*	H	·
8. nitida *E. Mey.*		*	*	H	·
9. recurva (*E. Mey.*) *Rolfe*		·	·	H	·
10. rotundifolia (*L.f.*) *Rolfe*		·	K	H	·
squarrosa Rolfe		*	*	*	*
SOLANACEAE. Fl. Cap. iv, s. 2, p. 87.					
Cestrum L.					
1. vespertinum *L.*	†	·	K	·	·
Datura L. (l.c. 118)					
1. Stramonium *L.* *Stinkblaar.*	†	*	K	H	·

[1] H. fruticosa *Sims*

Lycium L. (l.c. 109)				
1. afrum *L.*	*	*	*	U
2. austrinum *Miers*	·	K	·	·
3. campanulatum *E. Mey.*	G	*	*	·
4. cinereum *Sond.*	·	K	·	·
5. Prunus-spinosa *Dunal*	*	K	H	U
6. tetrandrum *Th.*	*	K	*	·
Nicotiana L. (l.c. 119)				
1. glauca *Grah.* †	*	*	H	U
Wild tobacco.				
Physalis L. (l.c. 105)				
1. minima *L.* †	·	·	H	·
2. peruviana *L.* †	*	K	H	·
1, *Kalkoengif.* 2, *Appel-der-liefde. Cape gooseberry.*				
Solanum L. (l.c. 88)				
1. aculeastrum *Dunal*	G	*	H	·
2. aculeatissimum *Jacq.*	·	K	H	·
3. Aggerum *Dunal*	·	K	H	·
4. aggregatum *Jacq.*	G	*	H	·
5. capense *L.*	G	K	H	·
6. coccineum *Jacq.*	·	·	H	·
7. duplosinuatum *Kl.*	*	*	H	·
geniculatum E. Mey.	*	*	*	·
8. giganteum *Jacq.*	*	K	H	·
9. incanum *Th.*	·	·	H	·
10. Lycopersicum *L.*	·	K	*	·
11. MacOwani *Fourc.*	·	·	H	·
12. nigrum *L.* †	G	K	H	·
13. pseudocapsicum *L.*	G	K	H	·
14. rigescens *Jacq.*	·	K	H	·
15. sodomaeum *Dunal var.* Hermanni (*Dunal*)	*	*	H	·
16. tomentosum *L.*	*	K	H	U
1, 15, *Gifappel, Bitter apple.* 10, *Tomato.* 12, *Black nightshade, Nastergul.*				
Withania Paucq. (l.c. 107)				
1. somnifera (*L.*) *Dunal*	*	K	H	·
Geneesblaaren.				
STERCULIACEAE. Fl. Cap. i, p. 179 (under BYTTNERIACEAE)				
Hermannia L. (l.c. 180, incl. **Mahernia** L., l.c. 207)				
1. altheifolia *L.*	G	K	H	U
2. alnifolia *L.*	·	·	·	U
3. angularis *Jacq.*	G	K	·	·
4. candicans *Ait.*	G	*	H	U
5. chrysophylla *E. & Z.*	·	·	H	·
6. coccicarpa *K. Schum.*	G	·	·	·
diversistipula Presl	*	*	*	·
7. filifolia *L.*	·	·	H	U

8. flammea *Jacq.*	*	K	H	U
var. Jacquini (*Harv.*)	G	·	·	·
var. polymorpha (*Harv.*)	·	K	H	·
9. flammula *Jacq.*	·	·	·	U
10. holosericea *Jacq.*	·	·	H	U
11. hyssopifolia *L.*	G	K	H	U
var. integerrima (*Schinz*)	G	·	·	·
12. Joubertiana *Harv.*	G	·	·	·
13. lacera *Fourc.*[1]	*	*	H	U
14. linifolia *L.*	G	·	·	U
15. mucronulata *Turcz.*	·	·	H	U
16. pilosula *Walp.*	*	*	*	U
pulchella L.f.[2]	*	*	*	·
18. pulverata *Andr.*	G	*	*	U
19. saccifera (*Turcz.*) *K. Schum.*[3]	G	*	H	U
20. salvifolia *L.*	G	K	H	U
var. oblonga (*Harv.*)	G	K	*	·
21. stipulacea *Lehm.*	G	*	H	U
22. sulcata *Harv.*	G	*	H	·
23. trifoliata *L.*	·	K	·	·
24. velutina *DC.*	·	·	H	U
25. veronicaefolia (*E. & Z.*) *Hochr.*[4]	·	·	H	·
11, *Ag-dag-geneesbos.*				

THYMELAEACEAE. Fl. Cap. v, s. 2, p. 1.

Gnidia L. (l.c. 42, incl. **Arthrosolen** C. A. Mey., l.c. 3, and **Lasiosiphon** Fresen., l.c. 69)

1. anomala *Meisn.*	G	K	·	·
2. anthylloides (*L.f.*) *Gilg.*.[4a]	G	K	H	·
3. capitata *L.f.*[5]	·	·	H	·
4. coriacea *Meisn.*	·	·	H	U
5. cuneata *Meisn. var.* spathulata (*Meisn.*)[6]	·	·	H	·
6. denudata *Lindl.*	G	K	H	·
7. *sp. F.* 4682 (G. Fourcadei *M. Moss ms.*)	G	·	·	·
8. Francisci *Bol. var.* sublanata (*M. Moss ms.*)	G	K	H	U
9. *sp.* F. 3459 (G. hirsuta *M. Moss ms.*)	G	·	·	·
var. petaloidea (*M. Moss ms.*) *F.* 5283	G	·	·	U
10. humilis *Meisn.*	G	·	H	·
11. imbricata *L.f.*	*	K	·	·
12. juniperifolia *Lam.*[7]	*	*	H	·
13. laxa (*L.f.*) *Gilg.*[8]	G	·	·	·
14. nodiflora *Meisn.*	G	K	*	U
15. obtusissima *Meisn.*	*	K	*	·
16. oppositifolia *L.*	G	K	H	U
17. orbiculata *C. H. Wr.*	G	·	·	U
18. pinifolia *L.*	*	K	H	·
19. polystachya *Berg.*	G	*	H	·

[1] Mahernia scabra *E. & Z* = H. scabra *Hochr. non Cav.* [2] Mahernia pulchella *Cav.*
[3] Mahernia ovalis *Harv.* [4] Mahernia veronicaefolia *E. & Z.*
[4a] Lasiosiphon anthylloides *Meisn.* [5] Lasiosiphon linifolius *Decsne.*
[6] Lasiosiphon Meyerianus *Endl.* [7] G. decurrens *Meisn.* [8] Arthrosolen laxus *C. A. Mey.*

20. psilotoides *Schinz*	G	·	·	·
21. racemosa *Th.*[1]	*	K	H	·
22. scabrida *Meisn.*	G	·	·	·
23. sericea *L. var.* hirsuta (*Meisn.*)	*	K	*	U
var. glabrescens (*Meisn.*)	G	K	·	·
24. sparsiflora *Bartl.*	G	·	·	·
25. spicata (*L.f.*) *Gilg*[2]	·	K	·	·
26. *sp. F.* 3968 (G. struthioloides *M. Moss ms.*)	·	·	H	·
27. stypheloides *Meisn.*[3]	·	·	H	·
Lachnaea L. (l.c. 13)				
1. Burchellii *Meisn.*	G	·	·	U
2. capitata (*L.*) *Meisn.*	G	·	·	·
3. diosmoides *Meisn.*	G	K	H	U
4. glomerata *Fourc.*	·	·	H	·
Passerina L. (l.c. 9)				
ericoides L.	*	*	*	·
1. falcifolia *C. H. Wr.*	G	K	H	·
2. filiformis *L.*	G	K	H	·
3. Galpini *C. H. Wr.*	*	*	H	·
4. montana *Thoday*	·	·	H	·
5. obtusifolia *Thoday*	·	·	H	U
6. pendula *E. & Z.*	·	·	H	U
7. rigida *Wickstr.*	G	K	H	·
8. rubra *C. H. Wr.*	G	*	*	·
9. vulgaris *Thoday*	*	K	H	·
In general Ganna.				
Struthiola L. (l.c. 26)				
1. angustifolia *Lam.*	G	·	·	·
2. argentea *Lehm.*	*	*	H	U
3. cicatricosa *C. H. Wr.*	G	*	H	·
4. Eckloniana *Meisn.*	G	K	·	U
5. epacridioides *C. H. Wr.*	G	·	·	·
6. erecta *L.*	·	K	H	·
7. Fourcadei *Compton*	·	K	H	U
8. garciana *C. H. Wr.*	G	K	H	·
9. hirsuta *Wickstr.*	G	K	H	U
10. longiflora *Lam.*	G	·	·	·
lucens Lam.	*	*	*	·
11. MacOwani *C. H. Wr.*	·	K	H	·
12. ovata *Th.*	*	*	H	U
var. lanceolata (*Meisn.*)	*	*	H	·
13. parviflora *Bartl.*	G	K	H	U
14. Pentheri *Sp. Moore*	G	K	H	·
striata Lam.	*	*	*	·
15. tuberculosa *Lam.*	G	*	*	·
16. virgata *L.*	G	·	·	·

[1] G. thesioides *Meisn.* [2] Arthrosolen spicatus *C. A. Mey.*
[3] Incl. G. quadrifaria *C. H. Wr.*

TILIACEAE. Fl. Cap. i, p. 223.				
Grewia L. (l.c. 224)				
1. occidentalis *L.*	G	K	H	·
Kruisbessie.				
Sparmannia L.f. (l.c. 223)				
1. africana *L.f.*	G	K	H	·
Stock rose, Stokroos.				
ULMACEAE. Fl. Cap. v, s. 2, p. 516.				
Celtis L. (l.c. 518)				
1. rhamnifolia *Presl*	G	K	H	·
Camdeboo Stinkwood, C. Stinkhout.				
UMBELLIFERAE. Fl. Cap. ii, p. 524.				
Alepidea Delaroche (l.c. 533)				
1. capensis (*Berg.*) *R. A. Dyer*[1] *var.* cordata (*E. Mey.*)	G	K	H	·
Annesorhiza Ch. & Schl. (l.c. 544)				
1. capensis *Ch. & Schl.*[2]	G	·	·	·
2. macrocarpa *E. & Z.*[3]	*	*	H	·
1, *Soet anijswortel.* 2, *Wilde anyswortel.*				
Apium L. (l.c. 534)				
1. decumbens *E. & Z.*	·	·	H	·
2. graveolens *L.* .... †	*	K	H	·
3. leptophyllum (*Pers.*) *F. v. Muell.*	·	·	H	·
Arctopus L. (l.c. 564)				
1. echinatus *L.*	*	K	H	U
Platdoring.				
Bupleurum L. (l.c. 541)				
1. Mundii *Ch. & Schl.*	·	·	H	·
Carum L. (l.c. 538)				
1. capense (*Th.*) *Sond.*	·	K	H	U
Caucalis L. (under **Torilis** Adans. l.c. 564)				
1. africana *Th.*[4]	*	K	H	·
Centella L. (under **Hydrocotyle** L., l.c. 526)				
1. asiatica (*L.*) *Urb.*[5]	*	K	*	·
2. glabrata *L.*[6]	G	K	*	·
3. debilis (*E. & Z.*) *Drude*[7]	·	K	*	·
4. eriantha (*Rich.*) *Drude*[8]	G	K	H	U
5. lanata *Compton*	·	K	·	U
6. montana (*Ch. & Schldl.*) *Domin*[9]	*	*	H	U
7. verticillata (*Th.*)[10]	*	K	H	·
8. virgata *L.*[11]	G	K	H	·
var. macrocarpa *forma* lanuginosa (*Domin*)[12] ..	G	·	·	·
var. macrocarpa *forma* brevifolia (*Domin*)[13] ..	G	·	·	·

[1] A. ciliaris *Delaroche.* [2] Incl. A. montana *E. & Z.* [3] Incl. A. spuria *E. & Z.*
[4] Torilis africana *Spreng.* [5] Hydrocotyle asiatica *L.* [6] Hydrocotyle Centella *Ch. & Schl.*
[7] Hydrocotyle debilis *E. & Z.* [8] Hydrocotyle eriantha *Rich.*
[9] Hydrocotyle montana *Ch. & Schl.* [10] Hydrocotyle verticillata *Th.*
[11] Hydrocotyle virgata *L. f.* [12] H. virgata var. lanuginosa *Ch. & Schl.*
[13] or C. virgata var. typica forma *Domin* = H. virgata var. nana *Ch. & Schl.*

Lichtensteinia Ch. & Schl. (l.c. 542)				
1. Beiliana *E. & Z.*	G	*	H	U
2. interrupta (*Th.*) *E. Mey.*	G	K	H	U
3. latifolia *E. & Z.*	G	*	H	·
4. trifida *Ch. & Schl.*	*	K	·	U
Oenanthe L. (l.c. 547)				
1. filiformis *Lam.*	G	K	H	·
Peucedanum L. (l.c. 553, and under **Bubon**, L., l.c. 559)				
1. capense (*Th.*) *Sond.*	G	K	H	·
2. capillaceum *Th.*	*	K	H	U
3. ferulaceum *Th.*	*	K	H	U
4. hypoleucum *Benth. & Hook.*[1]	*	*	H	U
5. multiradiatum (*E. Mey.*) *Druce*[2]	·	·	·	U
6. tenuifolium *Th.*[3]	*	*	H	U
1, *Lidbossie.* 6, *Wilde pieterselie.*				
Pimpinella L. (l.c. 538)				
1. stadensis (*E. & Z.*) *Harv.*	·	·	·	U
Rhyticarpus Sond.				
1. difformis (L.) *Benth. & Hook.*[4]	G	K	H	U
Sanicula L. (l.c. 533)				
1. europaea *L. var.* elata (*Wollf*)	G	K	H	U
Sonderina Wollf (under **Ptychotis** Koch, l.c. 536)				
1. tenuis (*Sond.*) *Wollf*[5]	·	K	H	·
Sium L. (l.c. 539)				
1. Thunbergii *DC.*	*	K	H	·
Trachyspermum Link (under **Ptychotis** Koch, l.c. 536)				
rigens E. & Z.[6]	*	*	*	·
URTICEAE. Fl. Cap. v, s. 2, p. 541				
Australina Gaud. (l.c. 552)				
1. caffra (*Th.*)[7]	·	K	·	·
2. capensis *Wedd.*	*	K	*	·
Droguetia Gaud. (l.c. 558)				
1. ambigua *Wedd.*	·	K	H	·
Fleurya Gaud. (l.c. 545)				
1. grossa *Wedd.*	·	K	*	·
2. mitis *Wedd.*	·	K	H	·
Urtica L. (l.c. 542)				
1. dioica *L.* †	G	·	·	U
2. urens *L.* †	*	K	*	·
Nettles, Brandnetels.				
VALERIANACEAE. Fl. Cap. iii, p. 39.				
Valeriana L. (l.c. 40)				
1. capensis *Th.*	G	K	H	U
Wilde balderjan, Cape valerian.				

[1] Bubon hypoleucum *Meisn.* [2] Bubon capense *Sond.* [3] Bubon tenuifolium *Sond.*
[4] Bupleurum difforme *Sond.* [5] Ptychotis tenuis *Sond.* [6] Ptychotis hispida *Sond.*
[7] A. acuminata *Wedd.*

VERBENACEAE. Fl. Cap. v, s. i, p. 180.				
Bouchea Cham. (l.c. 197)				
cernua (L.) Schauer	*	*	*	·
1. dehiscens (*L.f.*) *Druce*[1]	*	*	H	·
2. integrifolia *H. W. Pearson*	·	K	·	·
Lantana L. (l.c. 189)				
1. salviifolia *Jacq.*	*	*	H	·
Stilbe Berg. (l.c. 183)				
ericoides L.	*	*	*	·
Verbena L. (l.c. 207)				
1. bonariensis *L.* †	G	K	H	·
Wild verbena.				
VIOLACEAE. Fl. Cap. i, p. 72.				
Hybanthus Jacq. (under **Ionidium** Vent., l.c. 74)				
1. capensis (*Th.*) *Engler*[2]	·	·	H	·
Viola L. (l.c. 73)				
1. tricolor *L.*[3] †	·	·	H	·
ZYGOPHYLLACEAE. Fl. Cap. i, p. 351.				
Tribulus L. (l.c. 352)				
1. terrestris *L.* †	G	K	*	·
Dubbeltjes.				
Zygophyllum L. (l.c. 355)				
1. debile *Ch. & Schl.*	*	*	H	·
2. flexuosum *E. & Z.*	G	K	H	U
3. foetidum *Schr. & Wendl.*	*	*	H	·
4. Lichtensteinianum *Ch. & Schl.*	G	·	·	U
5. Morgsana *L.*	G	K	H	·
6. uitenhagense *Sond.*	·	K	H	·
2, *Spekbossie.*				
Class MONOCOTYLEDONES.				
AMARYLLIDACEAE. Fl. Cap. vi, p. 171.				
Amaryllis L. (l.c. 202)				
1. Belladona *L.*	·	K	·	·
Belladona Lily, Maartlelie.				
Ammocharis Herb. (l.c. 203)				
coranica Herb.[4]	*	*	*	·
Apodolirion Baker (l.c. 197)				
1. MacOwani *Bak.*	·	·	·	U
Boophone Herb. (**Buphane**, l.c. 242)				
1. disticha (*L.f.*) *Herb.*	·	·	H	U
Gifbol.				
Brunsvigia Heist. (l.c. 204)				
1. gigantea *Heist.*	*	K	H	·
2. grandiflora *Lindl.*	·	K	·	·
3. Josephinae (*Redouté*) *Ker.*	G	·	·	·

[1] B. cuneifolia *Schauer*. [2] Ionidium capense *R. & S.*
[3] Viola arvensis *Murr.* in Fl. Cap. [4] A. falcata *Herb.*

4. minor *Lindl.*	·	·	·	U
5. striata (*Jacq.*) *Ait.*	·	·	H	·
1, 3, *Kandelaarblom.*				
Crinum L. (l.c. 242)				
longifolium (L.) Th.	*	*	*	.
Cyanella L. (under **Haemodoraceae**, l.c. 6)				
capensis L.	*	*	*	.
1. lutea *L.f.*	G	K	H	U
Cyrtanthus Ait. (l.c. 218)				
1. angustifolius (*L.f.*) *Ait.*	*	K	H	·
collinus Burch.	*	*	*	.
lutescens Herb.	*	*	*	.
2. obliquus (*L.f.*) *Ait.*	·	K	H	·
3. uniflorus *Gawl.*	·	·	H	·
1, *Brand lelie.*				
Forbesia Eckl. (under **Curculigo** Gaertn., l.c. 173)				
1. plicata (*L.f.*) *Eckl.*	G	*	H	U
Gethyllis L. (l.c. 193)				
1. spiralis *L.f.*	G	*	*	U
2. unilateralis *L. Bol.*	G	·	·	·
1, *Kukumakranka.*				
Haemanthus L. (l.c. 229)				
1. albiflos *Jacq.*	·	K	H	·
2. Hookerianus *Herb.*	·	·	H	U
3. puniceus *L.*	G	K	H	·
4. rotundifolius *Gawl.*	·	K	·	·
Hessea Herb. (l.c. 189)				
1. gemmata (*Ker*) *Benth.*	G	·	·	U
Hypoxis L. (l.c. 174)				
1. angustifolia *Lam.*	·	K	H	·
2. argentea *Harv.*	*	*	H	·
3. canescens *Fisch. & Mey.*[1]	*	*	H	·
4. filiformis *Bak.*	·	K	H	·
5. floccosa *Bak.*	*	*	H	·
6. longifolia *Bak.*	G	K	H	·
7. Ludwigii *Bak.*	·	·	H	·
8. obliqua *Jacq.*[2]	·	·	H	·
9. sobolifera *Jacq.*[3]	·	K	H	·
10. stellipilis *Ker.*	·	·	H	·
11. villosa *L.f.*	*	*	H	·
12. Zeyheri *Bak.*[4]	·	·	H	·
11, *Inkbol.*				
Lanaria Ait. (l.c. 6)				
1. plumosa *Ait.*	·	K	H	·
Kapokblom.				
Nerine Herb. (l.c. 209)				
humilis (Jacq.) Herb.	*	*	*	·

[1] H. villosa var. canescens in Fl. Cap. [2] H. villosa var. obliqua in Fl. Cap.
[3] Under H. villosa in Fl. Cap. [4] Incl. H. setosa *Bak.*

1. undulata (*L.*) *Herb.*	·	·	H	·
Spiloxene Salisb. (under **Hypoxis** L., l.c. 174)[1]				
1. alba (*Thunb.*) *Fourc.*[2]	·	K	·	U
aquatica (L.f.) Fourc.[3]	*	*	*	·
2. minuta (*L.*) *Fourc.*[4]	*	*	H	·
3. trifurcillata (*Nel*) *Fourc.*[5]	G	K	H	U
Vallota Herb. (l.c. 217)				
1. speciosa (*L.f.*) *Dur. & Schinz*[6]	G	K	H	U
Berg lelie, Berg lily.				
APONOGETONACEAE. Fl. Cap. vii, p. 41 (under NAIADACEAE).				
Aponogeton Th. (l.c. 42)				
1. distachyon *L.f.*	G	K	H	·
2. Kraussianum *Hochst.*	·	·	H	·
3. spathaceum *Hook. f.*	·	K	*	·
1, *Water uintje.*				
ARACEAE. Fl. Cap. vii, p. 32 (under AROIDEAE).				
Zantedeschia Spreng. (under **Richardia** Kunth, l.c. 36)				
1. aethiopica (*L.*) *Spreng.*[7]	G	K	H	·
Arum lily, Pig lily, Varkblom.				
CANNACEAE.				
Canna L.				
1. indica *L.* †	·	·	H	·
Indian shot.				
COMMELINACEAE. Fl. Cap. vii, p. 7.				
Commelina L. (l.c. 8)				
1. africana *L.*	*	K	*	U
2. benghalensis *L.*	·	K	H	·
Cyanotis D. Don				
1. speciosa (*L.f.*) *Hassk.*[8]	*	K	*	H
CYPERACEAE. Fl. Cap. vii, p. 149.				
Bulbostylis Kunth (l.c. 204)				
1. collina *Kunth*	·	·	H	·
2. humilis *Kunth*	*	K	*	·
Carex L. (l.c. 299)				
1. aethiopica *Schkuhr.*	G	K	H	·
2. clavata *Th.*	*	K	H	·
3. cognata *Kunth*	G	K	H	·
4. Ecklonii *Nees*	*	K	*	·
5. vulpina *L.*[9] †	*	K	*	·
6. silvatica *Huds.* †	*	K	·	·
Sedges, Zegge.				

[1] Ianthe *Salisb.* (1866), *Janthe Nel* (1914), *non Janthe Griseb.* (1844). [2] Hypoxis alba *L.f.* [3] Hypoxis aquatica *L.f.* [4] Hypoxis minuta *L.f.* [5] Janthe trifurcillata *Nel.* [6] Vallota purpurea *Herb.* [7] Richardia africana *Kunth.* [8] C. nodiflora *Kunth.* [9] Incl. C. glomerata *Th*

Carpha R. Br. (l.c. 269)				
1. capitellata (*Nees*) *Rottb.*	*	*	H	·
2. glomerata (*Th.*) *Nees*	*	K	H	·
Sedges, Zegge.				
Chrysithrix L. (l.c. 292 and 760)				
1. capensis *L.*	G	*	H	·
2. Dodii *C. B. Cl.*	G	*	H	·
Cladium P. Browne (l.c. 291)				
1. jamaicense *Crantz*[1] †	*	K	H	·
Cyperus L. (l.c. 162)				
1. denudatus *L.f.*	*	*	*	U
fastigiatus Rottb.	*	*	*	.
2. immensus *C. B. Cl.*	·	K	·	·
longus L.	*	*	*	.
marginatus Th.	*	*	*	.
rupestris Kunth	*	*	*	.
sphaerospermus Schrad.	*	*	*	.
3. tenellus *L.f.*[2]	*	K	*	U
4. textilis *Th.*	*	K	*	·
5. usitatus *Burch.*	*	K	H	·
4, *Matjesgoed.*				
Eleocharis R. Br. (l.c. 197)				
1. limosa *Schultes*	*	*	H	·
2. Schlechteri *C. B. Cl.*	·	K	·	·
Ficinia Schrad. (l.c. 235)				
1. acuminata (*Steud.*) *Nees*	*	*	*	U
2. bicolor (*Nees*) *H. Pfeiff.*[3]	*	K	*	·
3. bracteata *Boeck.*	*	K	H	U
4. bulbosa (*L.*) *Nees.*	G	K	H	·
5. capillifolia (*Schrad.*) *C. B. Cl.*	G	K	H	·
6. contorta (*Nees*) *H. Pfeiff.*[4]	·	·	·	U
7. costata (*Boeck*) *H. Pfeiff*[5]	·	·	H	·
8. dasystachys *C. B. Cl.*	·	·	H	·
Ecklonea (Steud.) Nees	*	*	*	.
9. fascicularis *Nees*	·	K	H	U
10. filiformis (*Lam.*) *Schrad.*[5a]	G	K	H	U
11. gracilis (*Poir.*) *Schrad.*	*	K	H	·
12. indica (*Lam.*) *H. Pfeiff.*[6]	*	K	H	·
involuta Nees	*	*	*	.
13. ixioides *Nees*	·	·	·	U
laciniata (Th.) Nees	*	*	*	.
laevis Nees	*	*	*	.
14. lateralis (*Vahl*) *Kunth*[7]	*	K	H	U
15. leiocarpa *Nees*	·	K	H	·
16. quinquangularis *Boeck.*	G	·	·	·
17. ramosissima *Kunth*	*	K	*	U
18. repens (*Nees*) *Kunth*	*	K	*	·

[1] C. Mariscus *R. Br.* [2] Incl. C. minimus *C. B. Cl.* [3] Scirpus venustulus *Boeckl.* [4] F. stolonifera *Boeckl.* [5] Scirpus costatus *Boeckl.* [5a] Incl. F. rugulosa *C. B. Cl.* [6] Incl. F. setiformis *Schrad.* [7] F. aphylla *Nees.*

19. secunda (*Vahl*) *Kunth*	*	K	*	·
20. trichodes (*Schrad.*) *Benth.*	*	K	·	·
21. trigyna (*L.*) *Druce*[1]	G	*	H	·
22. trispicata (*L.f.*) *Druce*[2]	G	*	H	U
23. tristachya (*Rottb.*) *Nees*[3]	*	*	H	U
24. truncata (*Th.*) *Schrad.*[3a]	*	*	H	·
Fimbristylis Vahl (l.c. 199)				
1. complanata (*Retz*) *Link*	G	·	·	·
Fuirena Roettb. (l.c. 260)				
1. coerulescens *Steud.*	*	*	*	U
2. Ecklonii *Nees*	K	*	*	·
3. hottentotta (*L.*) *Druce*[4]	G	K	H	U
Juncellus C. B. Cl. (l.c. 161)				
1. laevigatus (*L.*) *C. B. Cl.*	*	*	H	·
Kyllinga Roettb. (l.c. 151)				
1. alba *Nees var.* alata (*C. B. Cl.*)	·	K	·	·
2. erecta *Schum.*	·	K	H	·
3. melanosperma *Nees*	·	·	H	·
Macrochaetium Steud. (l.c. 291)				
1. Dregei *Steud.*	G	*	H	U
Mariscus Gaertn. (l.c. 185)				
1. albo-marginatus *C. B. Cl.*	·	K	*	·
2. capensis (*Steud.*) *Schrad.*	·	·	H	·
3. congestus (*Vahl*) *C. B. Cl.*	*	K	H	·
4. durus (*Knuth*) *C. B. Cl.*	·	K	H	·
5. elatior (*Boeck.*) *C. B. Cl.*	*	*	H	·
6. Marlothii *C. B. Cl. var.* globispica (*C. B. Cl.*)	·	·	H	U
7. riparius *Schrad.*	*	K	*	U
var. robustior (*C. B. Cl.*)	·	·	H	·
tabularis (Schrad.) C. B. Cl.	*	*	*	·
Pycreus Beauv. (l.c. 155)				
Mundii Nees	*	*	*	.
1. polystachyus (*Th.*) *Beauv.*	*	K	*	U
2. umbrosus *Nees*	K	G	H	U
Rhynchospora Vahl (l.c. 267)				
1. glauca *Vahl*	*	*	H	·
Schoenoxiphium Nees (l.c. 297, and under **Carex**, l.c. 299)				
caricoides C. B. Cl.[5]	*	*	*	·
1. Ecklonii *Nees*[6]	*	K	*	·
2. lanceum *Kük.*[7]	*	K	H	·
3. rufum *Nees*	.	K	*	·
4. sparteum (*Wahl.*) *Kük.*[8]	*	K	H	·
var Lehmanni (*Kük.*)[9]	·	K	·	·
Schoenus L. (l.c. 271)				
nigricans L.	*	*	*	·

[1] F. scariosa *Nees*. [2] F. sylvatica *Kunth*. [3] Incl. F. albicans *Nees*.
[3a] Incl. F. praemorsa *Nees*. [4] F. hirta *Vahl*. [5] Carex Dregeana *Kunth*.
[6] Carex Zeyheri *C. B. Cl. p.pte.* [7] S. Sickmannianum *Kunth* & S. capense *Nees*.
[8] Carex spartea *Vahl*. [9] Carex Essenbachiana *Boeck*.

Scirpus L. (l.c. 210)				
1. antarcticus *L.*	G	*	H	·
2. striatus (*Nees*) *Fourc* [7]	*	*	H	·
3. cernuus *Vahl*	*	*	H	U
var. subtilis (*C. B. Cl.*)	*	*	H	·
4. costatus *Boeckl.*	·	K	·	·
fluitans L.	*	*	*	·
globiceps C. B. Cl.	*	*	*	·
5. Holoschoenus *L. var.* Thunbergii *C. B. Cl.*	*	*	H	·
6. Hystrix *Th.*	·	·	·	U
7. littoralis *Schrad.* †	*	K	*	·
8. Ludwigii (*Steud.*) *Boeck.*	G	K	H	·
maritimus L. †	*	*	*	·
9. membranaceus *Th.*	*	K	·	·
10. nodosus *Rottb.*	*	K	H	U
paludicola Kunth	*	*	*	·
11. prolifer *Rottb.*	G	*	H	U
12. rivularis *Boeckl.*	·	·	H	·
13. tenuis *Spreng.*	*	K	H	·
verruculosus Steud.	*	*	*	·
6, 9, *Bies.*				
Tetraria Beauv. (l.c. 275)				
1. angustifolia (*Lam.*) *H. Pfeiff.* [1]	*	*	H	U
2. aristata (*Boeck.*) *C. B. Cl.*	·	·	H	·
3. brevicaulis *C. B. Cl.* [2]	G	K	H	·
4. bromoides (*Lam.*) *H. Pfeiff.* [3]	*	*	H	·
5. capillacea (*Th.*) *C. B. Cl.*	G	*	H	·
6. circinalis (*Schr.*) *C. B. Cl.*	*	K	H	·
7. compar (*L.*) *Lestib.*	*	*	H	·
8. compressa *Turrill*	·	K	H	·
9. cuspidata (*Rottb.*) *C. B. Cl.*	G	*	H	U
10. Dregeana (*Boeck.*) *C. B. Cl.*	*	*	H	·
11. Fourcadei *Turrill & Schonl.*	G	·	·	U
12. gracilis *Turrill*	·	K	·	U
13. involucrata (*Rottb.*) *C. B. Cl.* [4]	G	K	H	U
14. pleiosticha *C. B. Cl.*	*	*	H	·
15. robusta (*Kunth*) *C. B. Cl.*	·	·	H	U
16. secans *C. B. Cl.*	G	K	H	·
thermalis (L.) C. B. Cl.	*	*	*	·
17. triangularis (*Boeck.*) *C. B. Cl.*	·	·	·	U
16, *Berg Klapper.*				
DIOSCOREACEAE. Fl. Cap. vi, p. 246.				
Dioscorea L. (l.c. 247, and **Testudinaria** Salisb., l.c. 252)				
1. Burchellii *Bak.*	G	*	*	·
2. cotinifolia *Kunth* [5]	·	K	H	·
3. elephantopus *Spreng.* [6]	·	·	H	·

[1] T. Rottboelloides *C. B. Cl.* [2] Costularia brevicaulis *C. B. Cl.* [3] T. Roettboelli *C. B. Cl.*
[4] Incl. T. spiralis *C. B. Cl.* [5] D. malifolia *Bak.* [6] Testudinaria elephantipes *Burch.*
[7] S. capillifolius *Parl.*

4. montana *Spreng.*[1]	·	K	H	U
5. Mundii *Bak.*	·	K	H	U
2, 3, *Olifantsvoet, Elephant's foot.*				
GRAMINEAE. Fl. Cap. vii, p. 310.				
Afrachneria Sprague (under **Achneria** Munro, l.c. 456)				
1. ampla (*Nees*) *Adamson*[2]	*	K	H	·
2. Steudelii (*Nees*)[3]	*	*	H	U
Agropyrum J. Gaertn. (l.c. 742)				
1. distichum (*Th.*) *Beauv.*	*	K	H	·
Suikerriet.				
Agrostis L. (l.c. 545)				
1. Bergiana *Trin.*	*	K	H	U
2. lachnantha *Nees*	*	K	*	U
Aira L. (l.c. 463)				
1. capillaris *Host.* †	·	·	H	·
2. caryophyllea *L.* †	*	*	*	U
Andropogon L. (l.c. 334)				
1. appendiculatus *Nees*	*	*	H	·
2. eucomus *Nees*	*	*	H	·
1, *Blougras.*				
Aristida L. (l.c. 551)				
1. angustata *Stapf*	*	K	·	·
barbicollis Trin. & Rupr.	*	*	*	·
capensis Th.	*	*	*	·
2. diffusa *Trin.*	·	·	·	U
3. junciformis *Trin. & Rupr.*	G	K	H	·
4. namaquensis *Trin.*	·	·	H	·
vestita Th.	·	·	·	·
Arundinella Raddi (l.c. 448)				
1. Ecklonii *Nees*	G	*	*	·
Arundo L. (l.c. 539)				
Donax L. †	*	*	*	·
Spanish Reed.				
Avena L. (l.c. 477)				
1. fatua *L.* †	*	*	H	·
Wild oats.				
Bambusa *Schreb.* (l.c. 748)				
1. Balcooa *Roxb.*	G	*	*	·
Bothriochloa O. Kze. (under **Andropogon** L., l.c. 334)				
1. pertusa (*Willd.*) *A. Camus*[4]	G	·	·	·
Brachiaria Gris. (under **Panicum** L., l.c. 382)				
1. serrata (*Th.*) *Stapf*[5]	G	K	H	U
Brachypodium Beauv. (l.c. 735)				
1. flexum *Nees*	G	*	H	·

[1] Testudinaria sylvatica *Kunth.* [2] Achneria ampla *Dur. & Sch.*
[3] Achneria capensis *Dur. & Sch.*
[4] Andropogon pertusus *Willd.* [5] Panicum serratum *Spreng.*

Briza L. (l.c. 707)					
1. maxima *L.*	†	*	K	H	U
2. minor *L.*	†	*	*	H	U
1, *Klokkies gras.*					
Bromus L. (l.c. 726)					
leptoclados Nees		*	*	*	·
molliformis Lloyd	†	*	*	*	·
1. japonicus *Th.*[1]	†	G	*	*	U
rigidus Roth[2]		*	*	*	·
Ceratochloa Beauv. (under **Bromus** L., l.c. 726)					
1. unioloides (*Willd.*) *Beauv.*[3]	†	*	*	H	·
Prairie grass.					
Cynodon Pers. (l.c. 633)					
1. Dactylon (*L.*) *Pers.*	†	*	*	H	·
2. incompletus *Nees*		G	*	H	·
1, *Fyn kweek, Fine quick, Bermuda grass.*					
2, *Regte kweek.*					
Cymbopogon Spreng. (under **Andropogon** L., l.c. 334)					
1. marginatus (*Steud.*) *Stapf*[4]		*	K	H	U
Koperdraad.					
Cynosurus L. (l.c. 689)					
1. echinatus *L.*	†	G	K	·	·
Dactylis L. (l.c. 695)					
1. glomerata *L.*	†	*	*	H	·
Cocksfoot.					
Danthonia DC. (l.c. 516)					
1. cincta *Nees*		G	*	H	U
2. curva *Nees*		G	*	H	·
disticha Nees		*	*	*	·
3. lanata *Schrad.*		G	*	*	·
4. lupulina (*Th.*) *R. & S.*		*	K	·	·
5. papposa *Nees*		G	*	*	U
6. stricta *Schrad.*		·	·	·	U
7. Zeyheriana *Steud.*		G	·	·	·
Demazeria Dumort. (under **Brizopyrum** Nees, l.c. 701)					
1. brachystachya (*Stapf*) *Phillips*[5]		*	*	H	·
2. capensis (*Spreng.*) *Hack*[6]		G	*	H	U
Digitaria Rich. (l.c. 372)					
1. argyrograpta (*Nees*) *Stapf*		G	K	*	·
2. diagonalis (*Nees*) *Stapf*		G	*	*	·
3. eriantha *Steud.*		·	K	*	·
4. sanguinalis (*L.*) *Scop.*	†	G	K	H	·
4, *Kruisgras.*					
Diplachne Beauv. (l.c. 590)					
1. fusca (*L.*) *Beauv.*		*	K	H	U
Echinochloa Beauv. (under **Panicum** L., l.c. 382)					
1. Crus-galli (*L.*) *Beauv.*[7]	†	G	K	*	·

[1] Bromus patulus *Mert. & Koch.* [2] Bromus maximus *Desf.* [3] Bromus unioloides *Willd.*
[4] Andropogon Nardus *L.* var marginatus (*Hack.*). [5] Brizopyrum brachystachyuum *Stapf.*
[6] Brizopyrum capense *Nees.* [7] Panicum Crus-galli *L.*

Ehrharta Th. (l.c. 660)				
1. aphylla *Schrad.*	*	*	*	U
2. brevifolia *Schrad.*	G	·	·	·
3. capensis *Th.*	G	*	H	·
4. calycina *Sm.*	G	K	H	U
5. dura *Nees*	·	·	·	U
6. erecta *Lam.*	G	K	*	·
7. gigantea *Th.*	*	*	H	·
8. longifolia *Schrad.*	*	*	*	U
9. ramosa *Th.*	*	K	H	·
10. Rehmannii *Stapf*	G	·	·	·
11. subspicata *Stapf.*	G	*	H	U
12. tricostata *Stapf.*	*	*	H	·
villosa Schult. f.	*	*	*	·
11, *Keur gras.*				
Eleusine Gaertn. (l.c. 644)				
1. indica (*L.*) *Gaertn.* †	*	*	H	·
Goose grass.				
Elionurus H. & B. (l.c. 332)				
1. argenteus *Nees*	·	·	H	·
Wildebees gras.				
Enneapogon Desv. (l.c. 654)				
1. scaber *Lehm.*	.	K	*	·
Suurgras.				
Eragrostis Beauv. (l.c. 594)				
1. Bergiana *Trin.*	G	·	·	·
2. bicolor *Nees*	G	*	*	·
3. brizoides (*L.f.*) *Nees*	*	*	H	U
calcantha Trin.	*	*	*	.
4. chloromelas *Steud.*	·	·	H	U
5. cilianensis *Link ex Lutati* [1]	·	K	*	·
6. curvula (*Schrad.*) *Nees*	G	K	*	·
var. conferta (*Nees*)	·	·	H	·
7. cyperoides (*Th.*) *Beauv.*	·	K	·	·
8. glabrata *Nees*	·	K	·	·
9. gummiflua *Nees*	·	·	·	U
10. obtusa *Munro*	*	*	H	·
11. sarmentosa (*Th.*) *Nees*	G	·	·	·
Eulalia Kunth (under **Pollinia** Trin., l.c. 324)				
1. villosa (*Th.*) *Stapf.* [2]	G	*	H	U
Eustachys Desv. (under **Chloris** Swartz, l.c. 640)				
1. paspaloides *Lanza & Matti* [3]	*	K	*	U
Festuca L. (l.c. 719)				
1. scabra *Vahl*	G	*	H	U
Fingerhuthia Nees (l.c. 690)				
1. sesleriaeformis *Nees*	·	·	H	·
Harpechloa Kunth (l.c. 639)				
1. Falx (*L.f.*) *O. Kze.* [4]	*	K	*	U

[1] E. major *Host.* [2] Pollinia villosa *Spreng.* [3] Chloris petraea *Th.* [4] H. capensis *Kunth.*

Helictotrichon Bess. ex. Schult. (under **Avenastrum** Juss., l.c. 472)					
capense Schweick.[1]		*	*	*	·
Hemarthria R. Br. (under **Rottboellia** L.f., l.c. 329)					
altissima (Poir.) Stapf & Hubbard[2]		*	*	*	·
Heteropogon Pers. (under **Andropogon** L, l.c. 334)					
1. contortus (*L.*) *Beauv.*[3]		*	K	H	·
Holcus L. (l.c. 464)					
1. lanatus *L.*	†	*	*	H	·
Yorkshire Fog.					
Hordeum L. (l.c. 744)					
murinum L.	†	*	*	*	·
nodosum L.[3a]	†	*	*	*	·
Wild barley.					
Hyparrhenia Anderss. (under **Andropogon** L., l.c. 334).					
1. hirta (*L.*) *Stapf*[4]		*	*	H	U
Imperata Cyr. (l.c. 320)					
1. cylindrica (*L.*) *Beauv. var.* Thunbergii *Dur. & Sch.*[4a]		*	*	H	·
Koeleria Pers. (l.c. 468)					
1. capensis (*Th.*) *Nees*[5]	†	*	K	H	U
2. phleoides *Pers.*	†	G	·	·	·
Lagurus L. (l.c. 542)					
ovatus L.	†	*	*	*	·
Lasiochloa Kunth (l.c. 697)					
1. ciliaris (*Nees*) *Kunth*		·	·	·	·
2. hispida (*Th.*) *Kunth*[6]		*	*	H	U
var. longifolia (*Nees*)[7]		·	·	H	·
Leersia Sw. (l.c. 659)					
1. hexandra *Sw.*		*	K	*	·
Lepturus R. Br. (l.c. 740)					
1. cylindricus (*Willd.*) *Trin.*	†	*	*	*	U
Lolium L. (l.c. 738)					
1. multiflorum *Lam.*	†	*	*	H	·
2. temulentum *L.*	†	*	*	H	
1, 2, *Drabok*, *Darnel.*					
Melica L. (l.c. 684)					
racemosa Th.		*	*	*	·
Dronk gras.					
Microchloa R. Br. (l.c. 635)					
caffra Nees		*	*	*	·
Microstegium Nees (under **Pollinia** Trin., l.c. 324)					
1. nudum (*Trin.*) *A. Camus*[8]		·	K	*	·
Miscanthidium Stapf (under **Erianthus** Michx., l.c. 322)					
1. capense (*Nees*) *Stapf*[9]		·	·	H	·
Oplismenus L. (l.c. 415)					
1. hirtellus (*L.*) *R. & S.*[10]		·	K	H	·

[1] Avenastrum antarcticum *Stapf p.pte.* [2] Rottbellia compressa var. fasciculata *Hack.*
[3] Andropogon contortus *L.* [3a] H. secalinum *Schreb.* [4] Andropogon hirtus *L.*
[4a] I. arundinacea *Cyr.* var. Thunbergii (*Hack.*)
[5] K. cristata *Pers.* [6] Lasiochloa longifolia var. hispida *Stapf.* [7] L. longifolia *Stapf.*
[8] Pollinia nuda *Trin.* [9] Erianthus capensis *Nees.* [10] O. africanum *Beauv.*

Panicum L. (l.c. 382)				
1. deustum *Th.*	*	K	*	·
2. Ecklonii *Nees*	·	·	H	·
3. longijubatum *Stapf*[1]	·	·	H	·
4. maximum *Jacq.*	*	K	H	·
5. repens L. †	*	K	·	·
6. Stapfianum *Fourc.*[2]	·	K	H	·
4, *Guinea grass, Buffelgras.*				
Paspalum L. (l.c. 369)				
1. dilatatum *Poir*	·	·	H	·
2. scrobiculatum *L. var.* Commersonii (*Stapf*)	·	K	*	·
3. distichum *L.*	*	K	H	·
Pennisetum Pers. (l.c. 430)				
1. macrourum *Trin.*	G	K	*	U
2. Thunbergii *Kunth*[3]	G	*	*	·
Pentameris Beauv. (l.c. 512)				
1. Dregeana *Stapf*	G	·	·	·
2. Thuarii *Beauv.*	G	·	·	·
Pentaschistis Stapf (l.c. 480)				
1. angustifolia (*Nees*) *Stapf*	*	*	*	U
2. curvifolia (*Schrad.*) *Stapf.*	*	*	H	·
eriostoma (Nees) Stapf	*	*	*	·
3. heptamera (*Nees*) *Stapf*	·	·	H	·
4. Thunbergii *Stapf*	*	K	H	·
5. tortuosa *Stapf*	*	K	·	·
6. viscidula (*Nees*) *Stapf*	·	·	·	U
Phalaris L. (l.c. 682)				
1. minor *Retz.* †	*	K	*	·
Small canary grass.				
Phragmites Trin. (l.c. 540)				
1. communis *Trin.* †	*	*	H	·
Common reed, Riet.				
Poa L. (l.c. 711)				
1. annua *L.* †	*	*	H	·
2. pratensis *L.* †	G	·	·	·
1, *Annual meadow grass.* 2, *Meadow fescue.*				
Polypogon Desf. (l.c. 543)				
1. lutosus (*Poir.*) *Hitch.* †	*	*	*	U
2. monspeliensis (*L.*) *Desf.* †	*	*	*	U
3. tenuis *Brongn.*	*	*	H	U
Rhynchelytrum Nees (under **Tricholaena** Schrad., l.c. 441)				
1. setifolium *Chiov.*[4]	G	K	H	U
Redtop.				
Schismus Beauv. (l.c. 692)				
1. barbatus (*L.*) *Juel*[5]	*	*	*	U
Scleropoa Griseb. (l.c. 718)				
rigida (L.) Griseb. †	*	*	*	·

[1] P. proliferum *var.* longijubatum *Stapf.* [2] P. minus *Stapf non Nash.*
[3] P. geniculatum *Leeke, non Jacq.* [4] Tricholaena setifolia *Stapf.* [5] S. fasciculatus *Beauv.*

Setaria Beauv. (l.c. 419)				
1. flabellata *Stapf*	G	K	H	·
Sorghum Moench. (under **Andropogon** L., l.c. 334)				
1. caffrorum (*Th.*) *Beauv.*[1]	·	K	*	·
2. verticilliflorum *Stapf.*[2] †	·	K	*	·
1, *Kaffir corn.* 2, *Johnson grass.*				
Sporobolus R. Br. (l.c. 578)				
1. centrifugus (*Trin.*) *Nees var.* filifolius (*Stent*)	.	K	H	·
2. capensis *Kunth*[3]	*	K	H	·
3. fimbriatus (*Trin.*) *Nees*	G	*	H	·
4. Fourcadei *S. Stent*	G	K	*	·
5. pectinatus *Hack.*	G	·	·	·
6. virginicus (*L.*) *Kunth*[4]	G	K	*	·
Stenotaphrum Trin. (l.c. 438)				
1. secundatum (*Walt.*) *O. Kze*[5]	*	K	H	·
Coarse quick, Grove kweek.				
Stipa L. (l.c. 571)				
1. Dregeana *Steud.*	G	*	*	·
Themeda Forsk. (under **Anthistiria** L.f., l.c. 366)				
1. triandra *Forsk.*[6]	G	K	*	U
Rooigras.				
Trachypogon Nees (l.c. 331)				
1. plumosus *Nees*[7]	*	*	H	U
Tragus Haller (l.c. 576)				
koelerioides Ascher.[8]	*	*	*	·
1. racemosa *Allm.* †	·	·	H	·
Tristachya Nees (l.c. 452)				
1. hispida (*Th.*) *K. Schum.*[9]	G	*	H	U
Rooisaad.				
Vulpia Gmel. (l.c. 723)				
1. bromoides (*L.*) *S. F. Gray* †	G	*	*	·
Myuros (L.) Gmel. †	*	*	*	·
HAEMODORACEAE. Fl. Cap. vi, p. 1, and under AMARYLLIDACEAE, l.c., p. 172.				
Pauridia Harv. (l.c. 172)				
1. minuta (*Th.*) *Dur. & Sch.*[10]	*	*	H	·
Wachendorfia L. (l.c. 1)				
1. paniculata *L.*	G	*	H	·
2. thyrsiflora *L.*	G	K	H	·
Rooikanol.				
HYDROCHARITACEAE. Fl. Cap. v, s. 3, p. 1.				
Halophila Thouars				
1. sp. *Duthie* 1215	·	K	·	·
Lagarosiphon Harv. (l.c. 1)				
1. muscoides *Harv.*	·	K	*	·

[1] Andropogon Sorghum *Brot.* [2] S. halepense *Nees.* [3] S. indicus *var* capensis *Engl.* [4] S. pungens *Kunth.* [5] S. glabrum *Trin.* [6] Anthistiria imberbis *Retz.* [7] T. polymorphus *Hack.* [8] T. major *Stapf.* [9] T. leucothrix *Trin.* [10] P. hypoxidoides *Harv.*

IRIDACEAE. Fl. Cap. vi, p. 7.				
Acidanthera Hochst. (l.c. 130)				
1. brevicollis *Bak.*	·	K	·	·
2. Fourcadei *L. Bol.*	·	·	H	U
3. roseoalba *Lewis*	G	·	·	·
Anapalina N. E. Br. (under **Antholyza** L., l.c. 165)				
1. longituba *Fourc.*	·	·	·	U
triticea N. E. Br.[1]	*	*	*	·
2. revoluta (*Burm.*) *N. E. Br.*[2]	*	*	H	·
Aristea Ait. (l.c. 48)				
1. anceps *Eckl.*	*	*	H	·
2. Bakeri *Klatt*[3]	*	K	H	U
3. capitata *Ker*	G	K	·	·
4. cognata *N. E. Br.*[4]	·	K	*	·
5. cuspidata *Schinz*	*	K	·	·
6. ensifolia *Muir*	*	K	H	·
7. pusilla (*Th.*) *Ker*	G	K	H	·
8. racemosa *Bak.*	G	·	·	·
9. schizolaena *Harv.*	·	K	*	·
10. simplex *H. Weim.*	G	·	·	U
11. spiralis (*L.f.*) *Ker*	·	·	·	U
Babiana Ker (l.c. 106)				
1. coerulescens *Eckl.*	*	*	H	·
2. fastigiata *L. Bol.*	G	·	·	·
3. Fourcadei *Lewis*	G	·	·	·
4. sambucina (*Jacq.*) *Ker*	·	·	H	U
var longituba (*Lewis ms.*)	·	K	H	U
Bobartia Ker (l.c. 43)				
1. filiformis (*L.f.*) *Ker*	*	K	·	·
2. gladiata (*L.f.*) *Ker*	G	·	·	·
gracilis Bak.	*	*	*	·
3. indica *L.*[5]	G	·	·	·
4. Keetii *Phillips*[6]	G	K	·	·
5. macrospatha *Bak.*	*	K	·	U
6. orientalis *Gillett*	·	·	H	U
7. robusta *Bak.*	G	·	·	·
8. rostrata *Gillett*	·	·	H	·
Chasmanthe N. E. Br. (under **Antholyza** L., l.c. 165)				
1. aethiopica (*L.*) *N. E. Br.*[7]	G	K	H	·
2. caffra (*Ker*) *N. E. Br.*[8]	G	K	H	·
3. intermedia (*Bak.*) *N. E. Br.*[9]	·	·	H	·
Crocosmia Planch. (l.c. 129)				
1. aurea *Planch.*	G	K	*	·
Dierama K. Koch & Bouché (l.c. 86)				
1. pendula *Bak.*	·	·	H	·
Dietes Salisb. (under **Moraea** L., l.c. 9)				
1. vegeta (*Mill.*) *N. E. Br.*	G	K	H	·

[1] Antholyza lucidor *L.f.* [2] A. nervosa *Th.* [3] A. paniculata *Bak.* [4] A. anceps *Bak. p. pte.* [5] B. spathacea *Ker.* [6] Distinct from B. aphylla. [7] Antholyza aethiopica *L.* [8] A. caffra *Bak.* [9] A. intermedia *Bak.*

Ferraria L. (l.c. 29)				
Ferrariola (Jacq.) Willd.[1]	*	*	*	·
1. undulata *L.*	·	·	·	U
Freesia Klatt (l.c. 98)				
1. Armstrongi *Watson*	G	*	H	·
2. corymbosa *N. E. Br.*[2]	·	·	H	U
3. lactea *Fenzl ex Klatt*	·	K	·	·
Galaxia Th. (l.c. 32)				
1. fugacissima (*L.f.*) *Druce*[3]	*	*	H	U
Geissorhiza Ker. (l.c. 65)				
1. bracteata *Klatt*	*	*	H	·
Dregei Bak.	*	*	*	·
2. foliosa *Klatt*	*	K	H	·
3. graminifolia *Bak.*	G	K	H	·
4. inconspicua *Bak.*	G	K	·	·
5. nana *Klatt*	·	·	H	·
6. Pappei *Bak.*	·	·	H	·
7. Patersoniae *L. Bol.*	G	K	H	·
8. secunda (*Delar.*) *Ker*	*	*	H	U
9. setacea (*Th.*) *Bak.*	G	K	*	·
10. violacea *Bak.*	·	K	·	·
Gladiolus L. (l.c. 135)				
angustus L.	*	*	*	·
1. blandus *Soland.*	*	*	H	·
brevifolius Jacq.	*	*	*	·
confusus N. E. Br.[4]	*	*	*	·
2. edulis *Burch.*	G	·	·	U
gracilis Jacq.	*	*	*	·
3. grandis *Th.*	G	K	H	·
4. inflatus *Th.*[5]	G	K	H	U
5. involutus *Delar.*[6]	·	·	H	·
6. maculatus *Sw.*[7]	*	*	H	·
7. orchidiflorus *Andr.*	G	·	·	·
8. permeabilis *Delar.*	*	*	H	·
9. pulchellus *Klatt*	*	*	H	·
10. recurvus *L.*[8]	·	·	H	·
11. socium *L. Bol.*	G	·	·	·
12. splendens *Bak.*	G	*	H	U
13. Taubertianus *Schltr.*	·	·	·	U
14. tristis *L.*[9]	G	K	*	·
var. concolor (*Bak.*)	·	·	H	·
15. undulatus *Jacq.*	·	K	H	U
16. vaginatus *Bol. f.*	·	K	·	·
17. vittatus *Horn.*	G	·	·	U
Hebea Hedw. f. (under **Gladiolus** L., l.c. 135)				
parviflora Jacq.[10]	*	*	*	·
1. unguiculata (*Bak.*) *L. Bol.*[11]	G	·	·	·

[1] F. antherosa *Ker.* [2] F. refracta *Klatt.* [3] G. graminea *Th.* [4] G. tenellus *Bak.*
[5] *Th. non Baker*, G. Bolusii var. Burchellii *L. Bol.*, G. involutus *Bak. non Delar.*
[6] *Delar. non Baker.* [7] G. recurvus Fl. Cap. *non L.* [8] *L. non* Fl. Cap.
[9] Incl. G. flavidus *Ingram.* [10] Gladiolus parviflorus *Jacq.* [11] Gladiolus unguiculatus *N. E. Br.*

Helixyra Salisb. (under **Moraea** L., l.c. 9)				
1. Rogersii (*Bak.*) *N. E. Br.*[1]	·	K	H	·
Hesperantha Ker. (l.c. 57)				
1. angusta (*Jacq.*) *Ker*	*	*	H	·
2. falcata (*L.f.*) *Ker*	*	*	H	·
3. lutea (*Eckl.*) *Benth.*	·	·	·	U
4. recurva (*Th.*) *Asch. & Graebn.*[2]	G	K	*	U
var. caricina (*Ker*)	·	·	H	·
Hexaglottis Vent. (l.c. 31)				
1. flexuosa (*L.f.*) *Sw.*	G	*	H	U
2. longifolia (*Jacq.*) *Vent.*	G	K	H	·
Homeria Vent. (l.c. 26)				
1. collina (*Cav.*) *Vent.*	*	*	H	U
2. Cookii *L. Bol.*	·	·	·	U
3. miniata (*Andr.*) *Sw.*	G	*	*	·
4. lilacina *L. Bol.*	G	·	·	U
Homoglossum Salisb. (under **Antholyza** L., l.c. 165)				
1. Fourcadei (*L. Bol.*) *N. E. Br.*[3]	·	K	·	U
2. Hollandii *var.* zitzikammense *L. Bol.*	·	·	H	·
Ixia L. (l.c. 76)				
1. flexuosa *L.*	G	*	H	·
2. incarnata *Jacq.*[4]	·	·	·	U
3. paniculata *Delar.*	·	·	·	U
4. polystachya *L.*	G	*	H	·
5. sp. *Burch.* 6118, *Galp.* 4681	G	*	H	·
Lapeyrousia Pourr. (l.c. 88)				
1. fissifolia (*Jacq.*) *Ker.*	G	K	·	·
2. juncea *Pourr.*	G	*	H	U
Melasphaerulea Ker (l.c. 115)				
1. ramosa (*L.*) *Klatt*[5]	G	K	H	·
Micranthus Pers. (l.c. 97)				
1. plantagineus *Eckl.*	*	*	H	·
Moraea L. (l.c. 9)				
1. angusta (*Th.*) *Ker*	*	K	·	·
2. aristata *Asch. & Graebn.*[1]	*	K	·	·
3. crispa *Ker var.* rectifolia (*Bak.*)	G	·	·	·
4. edulis (*L.f.*) *Ker*	*	K	·	·
5. Pavonia (*L.f.*) *Ker var.* lutea (*Bak.*)	G	*	H	·
6. polystachya (*Th.*) *Ker*	G	*	H	U
7. ramosissima (*L.f.*) *Druce*[7]	G	K	H	·
8. spathulata (*L.f.*) *Klatt*[8]	G	K	H	U
9. spiralis *Delar.*	·	K	·	·
10. tenuis *Ker*	G	*	H	·
11. tricuspis *Ker*	G	K	·	U
12. tripetala (*L.f.*) *Ker*	G	*	H	U
13. unguiculata *Ker*	G	*	H	·
14. viscaria (*L.f.*) *Ker*	·	K	H	·

[1] Moraea Rogersii *Bak.* [2] H. radiata *Ker.* [3] Antholyza Fourcadei *L. Bol.* [4] I. scariosa *Th.*
[5] M. graminea *Ker.* [6] M. glaucopis *Draper.* [7] M. ramosa *Ker.* [8] M. spathacea *Ker.*

Romulea Maratti (l.c. 36)				
1. alpina *L. Bol.*	·	·	·	U
2. bulbocodioides (*Delar.*) *Bak.*	*	*	H	·
3. chloroleuca (*Jacq.*) *Bak.*	G	*	H	·
4. longifolia (*Salisb.*) *Bak.*	·	·	H	·
5. longipes *Schltr.*	·	·	H	·
6. minutiflora *Klatt*	*	*	H	·
7. rosea (*L.*) *Eckl.*	*	*	H	·
8. triflora *N. E. Br.*[1]	*	*	H	·
Tritonia Ker (l.c. 118)				
1. chrysantha *Fourc.*	·	·	·	U
2. dubia *Eckl.*	·	·	H	·
3. laxifolia *Benth.*	G	*	*	·
4. lilacina *Bol. f.*	·	·	·	U
5. lineata *Ker*	*	*	H	U
6. securigera (*Ait.*) *Ker*	G	·	·	U
Watsonia Miller (l.c. 99)				
1. aletroides (*Burm.*) *Ker.*	G	·	·	U
2. angusta *Ker*	*	K	H	U
3. Beatricis *Matt. & . Bol.*	G	*	H	·
4. brevifolia *Ker*	G	K	·	·
5. Desmidtii *L. Bol.*	G	K	·	·
6. Fourcadei *Matt. & L. Bol.*	G	K	H	·
7. Galpinii *L. Bol.*	·	K	H	U
glumacea (Th.) Asch. & Graebn.[2]	*	*	*	·
8. humilis *Mill.*	G	*	*	·
9. knysnana *L. Bol.*	G	K	H	·
10. longifolia *Matt. & L. Bol.*	.	K	H	·
11. Pillansii *L. Bol.*	G	·	·	·
12. Priori *L. Bol.*	G	·	·	·
13. Wilmaniae *L. Bol.*	·	K	H	U
JUNCACEAE. Fl. Cap. vii. p. 16.				
Juncus L. (l.c. 17)				
1. acutus *L.* †	*	*	H	·
2. bufonius *L.* †	G	*	*	U
3. capensis *Th.*	G	K	H	U
var. delicatulus (*Adamson*)	*	K	*	·
cephalotes Th.	*	*	*	·
4. Dregeanus *Kunth*	G	K	H	·
5. exsertus *Buch.*	·	·	H	·
indescriptus Steud.	*	*	*	·
6. Kraussii *Hochst.*[3] *var.* effusus (*Adamson*)	G	K	H	·
var. parviflorus (*Adamson*)	·	·	H	·
7. lomatophyllus *Spreng.*	*	K	H	U
8. oxycarpus *E. Mey.*	*	K	*	U
var. microphyllus (*Adamson*)	·	K	H	·
9. punctorius *L.f.*	*	*	H	U

[1] R. sublutea *Bak.* [2] W. rosea *Ker.* [3] J. maritimus *Bak.*

10. Sonderianus *Buch.*	*	K	*	·
Rushes.				
Prionium E. Mey. (l.c. 28)				
1. serratum (*L.f.*) *Drège*[1]	G	K	H	U
Palmiet.				
JUNCAGINACEAE. Fl. Cap. vii, p. 41 (under NAIADACEAE).				
Triglochin L. (l.c. 41)				
1. bulbosum *L.*	*	K	*	·
2. laxiflorum *Guss.*	*	K	*	·
3. striatum *Ruiz & Pavon*	*	K	H	·
LEMNACEAE. Fl. Cap. vii, p. 39.				
Lemna L. (l.c. 39)				
1. gibba *L.* †	*	K	*	·
minor L. †	*	*	*	·
Duckweeds.				
Wolffia Horkel (l.c. 40)				
1. arrhiza (*L.*) *Wimm.*[2]	·	K	·	·
LILIACEAE. Fl. Cap. vi, p. 253.				
Agapanthus L'Hér. (l.c. 402)				
1. orientalis *Leighton*[3]	G	K	H	·
Albuca (l.c. 451)				
1. alba *Lam.*[4]	G	*	H	·
2. Cooperi *Bak.*	G	*	H	U
3. corymbosa *Bak.*	·	·	H	·
4. exuviata *Bak.*	·	·	H	U
5. fastigiata *Dryand.*	·	K	H	·
6. flaccida *Jacq.*	G	·	·	·
7. Nelsoni *N. E. Br.*	·	·	H	·
minor L.	*	*	*	·
8. pachychlamys *Bak.*	·	·	H	·
9. tenuifolia *Bak.*	·	·	H	U
10. tortuosa *Bak.*	·	·	·	U
11. setosa *Jacq.*	·	K	*	U
12. Schonlandi *Bak.*	·	·	H	·
13. spiralis *L.f.*	·	·	·	U
Allium L. (l.c. 407)				
1. Scorodoprasum *L.*[5]	·	·	·	U
Wilde look, Wild leek.				
Aloe L. (l.c. 302)				
1. arborescens *Mill.*[6]	G	K	H	·
var. frutescens (*Salm-Dyk*)	G	*	H	·
2. africana *Mill.*	·	·	H	·
3. ciliaris *Haw.*	·	·	H	·
4. ferox *Mill.*	G	*	H	·

[1] P. palmita *E. Mey.* [2] W. Micheli *Schl.* [3] Under A. umbellatus in Fl. Cap.
[4] A. altissima *Dryand.* [5] A. Dregeanum *Kunth.* [6] Incl. A. Salm-Dyckiana *Schult. f.*

5. humilis *Mill.*	·	·	H	·
var. echinata (*Willd.*)	·	·	·	U
6. latifolia *Haw.*	·	·	H	·
7. lineata *Haw.*	·	·	·	U
8. microcantha *Haw.*	·	·	H	U
9. mitriformis *Mill.*	·	·	·	U
10. Muirii *Marl.*	G	·	·	·
11. platylepis *Bak.*	·	·	H	·
12. saponaria *Haw.*	G	K	*	·
13. striata *Haw.*	·	·	H	·
14. variegata *L.*	·	·	·	U
4, *Alwyn.* 14, *Kanniedood.*				
Androcymbium Willd. (l.c. 516)				
1. eucomoides (*Jacq.*) *Willd.*	*	*	H	·
2. leucanthum *Willd.*	*	K	H	·
Anthericum L. (l.c. 378)				
1. affine (*Kunth*) *Bak.*[1]	G	*	H	·
2. ciliatum *L.f.*	*	K	H	·
3. elongatum *Willd.*	*	*	H	·
falcatum L.f.	*	*	*	·
4. flexifolium *L.f.*	G	·	·	·
5. hirsutum *Th.*	*	*	H	·
longifolium Jacq.	*	*	*	·
6. muricatum *L.f.*	·	·	·	U
7. pudicum *Bak.*	G	*	H	·
8. revolutum *L.*	*	K	*	·
9. scabrum *L.f.*	*	*	H	·
triflorum Ait.	*	*	*	·
2, *Wilde blomkool.* 8, *Hotnotskool.*				
Asparagus L. (l.c. 256)				
1. africanus *Lam.*	*	K	H	·
2. aethiopicus *L.*	·	K	H	·
3. asparagoides (*L.*) *F. W. Wright*[2]	*	K	H	·
var. falciformis (*Baker*)	·	·	H	·
4. Burchellii *Bak.*	·	·	H	·
5. capensis *L.*	*	K	*	·
6. crispus *Lam.*	G	*	*	·
7. declinatus *L.*	G	K	*	·
8. erectus *Th.*	·	·	H	·
exuvialis Burch.	*	*	*	·
9. Kraussii *Bak.*	*	K	*	·
10. Nelsoni *Bak.*	·	K	·	·
11. plumosus *Bak.*	·	K	*	·
retrofractus L.	*	*	*	·
12. scandens *Th.*	G	K	H	·
13. striatus (*L.f.*) *Th.*	·	·	H	U
14. subulatus *Th.*	·	·	H	·
15. tetragonus *Bresl.*[3]	·	·	H	U

[1] A. pubescens *Bak.* [2] A. medeoloides *Th.* [3] A. racemosus var. tetragonus *Bak.*

16. Thunbergianus *Sch. Bip.*	G	K	H	·
1, 16, *Wag-'n-bietje.* 3, *Cape smilax.*				
Bulbine L. (l.c. 359)				
1. altissima (*Mill.*) *Fourc.*[1]	G	·	·	·
2. alooides *Willd.*	·	·	H	·
3. asphodeloides (*L.*) *Schultes*	G	K	·	U
4. caespitosa *Bak.*	G	*	*	·
5. filifolia *Bak.*	·	K	H	U
6. frutescens (*L.*) *Willd.*[2]	·	·	H	·
7. latifolia (*L.f.*) *Schultes*	·	K	H	·
8. mesembryanthemoides *Haw.*	G	*	*	U
9. narcissifolia *Salm-Dyk*	·	K	H	·
10. pallida *Bak.*	·	·	H	·
11. praemorsa (*Jacq.*) *Schultes*	*	*	H	·
12. pugioniformis (*Jacq.*) *Link*	G	*	H	·
13. rostrata (*Jacq.*) *Willd.*	·	·	H	·
2, *Rooiwortel.* 7, *Waterglas.*				
Bulbinella Kunth (l.c. 355)				
1. cauda-felis (*L.*) *Dur. & Sch.*[3]	·	·	·	U
Caesia R. Br. (l.c. 400)				
1. contorta (*L.f.*) *Dur. & Sch.*[4]	G	K	H	·
Chlorophytum Ker. (l.c. 397)				
1. capense (*L.*) *O. Kze.*[5]	*	K	H	·
2. comosum (*Th.*) *Bak.*	*	K	H	U
3. tuberculatum *Duthie*	·	·	·	U
4. sp. *F.* 3393 (C. Fourcadei *Moss ms.*)	G	·	·	U
Dipcadi Medik. (l.c. 445)				
1. brevifolium (*Th.*) *Fourc.*[6]	*	*	H	·
ciliare (E. & Z.) Bak.	*	*	*	·
viride (L.) Moench	*	*	*	·
Dipidax Salisb. (l.c. 523)				
1. triquetra (*L.f.*) *Bak.*	*	*	H	·
Drimia Jacq. (l.c. 436)				
1. anomala *Benth.*	·	·	·	U
2. Burchellii *Bak.*	·	K	H	U
elata Jacq.	*	*	*	·
3. haworthioides *Bak.*	G	*	H	·
4. media *Jacq.*	G	K	*	·
5. sp. *F.* 4580	·	·	H	·
Eriospermum Jacq. (l.c. 369)				
1. albucoides *Bak.*	G	·	·	·
2. Bellendeni *Sw.*	·	·	H	·
3. brevipes *Bak.*	·	K	H	·
4. cylindricum *Marl.*	·	·	H	U
5. Dregei *Schonl.*	·	·	H	·
6. capense (*L.*) *Salter.*[7]	*	*	*	U
7. lanceaefolium *Jacq.*	·	K	·	U

[1] B. longiscapa *Willd.* [2] B. caulescens *L.* [3] B. caudata *Kunth.*
[4] C. Thunbergii *Kunth.* [5] C. elatum *R. Br.* [6] D. hyacinthoides *Bak.* [7] E. latifolium *Jacq.*

8. parvifolium *Jacq.*	*	K	·	U
9. *sp.* *F.* 3869 (E. cinctum *Marl. ms.*)	G	·	·	·
10. *sp.* *F.* 3310 (E. molle *Marl. ms.*)	G	K	H	·
11. *sp.* F. 3330 (E. nervosum *Marl. ms.*)	G	*	H	U
12–14. *spp.* F. 3833 (G), *F.* 3868 (G), *F.* 5034 (U)				
Eucomis L'Hér. (l.c. 475)				
1. undulata *Ait.*	·	·	H	·
Gasteria Duval (l.c. 286)				
1. acinacifolia (*Jacq.*) *Haw.*	·	K	H	·
2. Armstrongii *Schonl.*	·	·	H	·
3. Beckeri *Schonl.*	G	*	H	·
4. carinata (*Mill.*) *Haw.*	G	·	·	·
5. conspurcata (*Salm-Dyk*) *Haw.*	G	·	·	·
6. disticha (*L.*) *Haw.*	G	·	·	·
7. fusco-punctata *Bak.*	·	·	·	U
8. humilis *v. Poelln.*	G	·	·	·
9. maculata (*Th.*) *Haw.*	·	·	·	U
10. obtusifolia *Haw.*	G	·	·	·
11. parvifolia *Bak.*	G	·	·	·
12. pulchra (*Jacq.*) *Haw.*	·	·	H	·
13. retata *Haw.*	·	K	·	·
14. Thunbergii *N. E. Br.*	·	·	·	U
15. trigona *Haw*[1]	·	·	H	·
16. verrucosa *Haw.*	·	·	H	·
Haworthia Duval (l.c. 332)				
1. altilinea *Haw.*	·	·	·	·
var. typica *v. Poelln.*	G	·	H	·
var. limpida (*Haw.*) *v. P.*	·	·	·	·
forma typica *v. P.*	·	·	H	·
forma acuminata *v. P.*	·	·	H	·
var. denticulata (*Haw.*) *v. P.*[2]	·	·	H	·
(15). angustifolia[3] *var.* denticulifera *v. P.*	G	·	·	·
2. aristata *Haw.*	G	·	·	·
3. asperula *Haw.*	G	·	·	U
4. Bolusii *var.* aranea *Berger*	G	·	·	·
5. caespitosa *forma* subplana *v. P.*	·	·	·	U
6. coarctata *Haw.*	G	·	·	·
7. chlorocantha *Haw.*	G	·	·	·
var. subglauca *v. P.*	G	·	·	·
8. cuspidata *Haw.*	G	·	·	·
9. cymbiformis *Duval*	·	·	·	U
var. transluscens *Trieb.* & *v. P.*	·	·	H	U
10. fasciata *Haw.*	·	·	H	U
var. caespitosa *v. P.*	G	·	·	·
forma major *v. P.*[4]	·	·	H	·
forma ovato-lanceolata *v. P.*	·	·	H	·
forma subconfluens *v. P.*	·	·	H	·
11. Haageana *v. P.*	·	·	·	U
12. Helmae *v. P.*	G	·	·	U

[1] acinacifolia var. trigona *v.P.* [2] H. denticulata *Haw.* [3] H. angustifolia *Bak. non Haw.*
[4] H. fasciata *var.* major *Berger.*

13. integra *v. P.*	·	K	·	·
14. Longiana *v. P.*	·	·	H	·
15. monticola *Fourc.*[1]	G	·	·	U
16. Parksiana *v. P.*	G	·	·	·
17. pilifera *var.* Gordoniana *v. P.*[2]	·	·	H	·
18. planifolia *Haw.*	·	·	·	·
var. longifolia *forma* calochlora *Tr. & v. P.*	·	·	H	·
var. transiens *v. P.*	·	·	·	U
19. pygmaea *v. P.*	G	·	·	·
20. Radula (*Jacq.*) *Haw.*	·	·	H	·
21. retusa (*L.*) *Haw.*	G	·	·	U
22. Schmidtiana *v. P.*	G	·	·	·
23. setata *Haw.*	G	·	·	·
var. xiphiophylla (*Bak.*) *v. P.*[3]	G	·	·	·
24. sub-attenuata (*Salm-Dyk*) *Bak.*	G	·	·	·
25. subfasciata (*Salm-Dyk*) *Bak.*	G	·	·	·
var. Kingiana *v. P.*[4]	G	·	·	·
26. subulata *Bak.*	G	·	·	·
27. transluscens *Haw.*[5]	·	·	·	U
28. tuberculata *v. P.*	·	·	·	·
var. acuminata *v. P.*	·	·	·	U
var. sublaevis *v. P.*	·	·	·	U
29. turgida *var.* suberecta *v. P.*	G	·	·	·
30. viscosa (*L.*) *Haw.*	·	·	·	U
var. indurata (*Haw.*) *Bak.*	·	·	·	U
var. torquata (*Haw.*) *Bak.*	·	·	H	·
31. vittata *Bak.*	·	·	H	·
Kniphofia Moench (l.c. 275)				
1. drepanophylla *Bak.*	·	·	H	·
2. Uvaria (*L.*) *Hook.*[6]	*	*	H	·
2, *Red hot poker, Soldaat.*				
Lachenalia Jacq. (l.c. 421)				
1. algoensis *Schonl.*	·	·	H	·
2. haarlemensis *Fourc.*	·	·	·	U
orchioides (L.) Ait.	*	*	*	.
pustulata Jacq.	*	*	*	.
3. reflexa *Th.*	*	*	H	U
4. subspicata *Fourc.*	G	*	H	·
5. tricolor *L.*	*	K	*	.
6. unicolor *Jacq.*	G	·	·	·
7. unifolia *Jacq.*	G	·	·	U
var. Pappei (*Bak.*)	G	·	·	·
8. Youngii *Bak.*	G	K	H	·
Massonia Th. (l.c. 408)				
1. candida *Burch.*	*	K	·	·
2. hirsuta *Link. & Otto*	.	.	H	.
latifolia L.f.	*	*	*	.

[1] H. angustifolia *Bak. non Haw.* [2] H. Gordoniana *v. P.* [3] H. xiphiophylla *Bak.*
[4] H. Kingiana *v. P.* [5] H. pellucens *Haw.* [6] K. alooides *Moench.*

3. modesta *Fourc.*	·	·	H	·
4. pustulata *Jacq.*	G	K	·	·
5. versicolor *Bak.*[1]	G	*	*	U
Neodregea C. H. Wright				
1. Glassii *C. H. Wright*	*	K	*	·
Ornithogalum L. (l.c. 494)				
1. aureum *Curt.*[2]	*	K	H	·
2. barbatum *Jacq.*	G	·	·	·
3. Bergii *Schldl.*	*	*	H	·
4. capillifolium *Fourc.*	·	·	H	U
5. caudatum *Ait.*	·	·	H	·
coarctatum Jacq.	*	*	*	·
6. comptum *Bak.*	·	K	*	U
7. Eckloni *Schldl.*	·	K	*	·
8. graminifolium *Th.*	·	·	H	·
9. limosum *Fourc.*	·	·	H	·
10. longebracteatum *Jacq.*	*	K	*	·
11. petraeum *Fourc.*	·	·	H	·
12. Rogersii *Bak.*	G	·	·	·
13. rupestre *L.f.*	*	*	H	·
14. scilloides *Jacq.*	·	K	·	·
15. subspicatum *Bak.*	·	·	·	U
16. tenellum *Jacq.*	*	*	H	·
17. thyrsoides *Jacq.*	G	K	H	·
17, *Chinkerichee.*				
Ornithoglossum Salisb. (l.c. 524)				
1. viride (*L.f.*) *Dryand.*[3]	·	·	·	U
Slangkop.				
Polyxena Kunth (l.c. 418)				
1. ensifolia (*Th.*) *Schonl.*[4]	·	·	·	U
2. pygmaea *Kunth*	·	·	·	U
Sanseviera Th. (l.c. 4)				
1. zeylanica *Willd.*	·	·	H	·
Scilla L. (l.c. 478)				
1. apertiflora (*Bak.*) *C. A. Sm.*[5]	·	·	·	U
2. lanceifolia (*Jacq.*) *Bak.*	·	·	H	·
3. ensifolia (*Eckl.*) *Britt.*[6]	·	K	H	·
4. maculata *Schrank*	·	·	H	·
5. ovalifolia (*Schrad.*) *C. A. Sm.*[7]	·	K	·	·
6. pusilla *Bak.*	·	·	H	·
7. Rogersii *Bak.*	·	K	·	·
8. undulata (*Jacq.*) *Bak.*	·	·	H	·
9. violacea *Hutch.*	·	·	H	·
10. sp. *F.* 3937	·	·	H	·
11. sp. *F.* 3878	G	·	·	·

[1] Incl. M. calvata *Bak.*, M. amygdalina *Bak.*, and M. concinna *Bak.*
[2] O. thyrsoides var. aureum *Bak.* [3] O. glaucum *Salisb.* [4] Incl. in P. pygmaea in Fl. Cap.
[5] S. lorata *Bak.* [6] S. Ludwigii *Bak.* [7] S. revoluta *Bak.*

Tulbaghia L. (l.c. 403)				
acutiloba Harv.	*	*	*	·
alliacea L.f.	*	*	*	·
1. capensis *L.*	·	·	·	U
var. gracilis (*Bak.*)	·	·	H	·
2. cepacea *L.f.*	·	·	H	·
3. violacea *Harv.*	·	K	H	·
Urginea Steinh. (l.c. 462)				
1. altissima (*L.f.*) *Bak.*	*	*	H	·
2. capitata *Bak.*	·	·	H	·
3. ciliata (*L.f.*) *Bak.*	·	·	·	U
4. Dregei *Bak.*	*	K	H	U
exuviata (Jacq.) Steinh.	*	*	*	·
5. filifolia (*Jacq.*) *Steinh.*	*	*	H	·
Veltheimia Gleditsh (l.c. 470)				
1. capensis (*L.*) *Redouté*	·	·	H	·
Wurmbea Th. (l.c. 521)				
spicata (Burm.) Dur. & Sch.	*	*	*	·
MUSACEAE. Fl. Cap. v, s. iii, p. 313 (under SCITAMINEAE).				
Strelitzia Ait. (l.c. 316)				
alba (*L.f.*) *Skeels* [3]				
1. augusta *Th.*	·	K	H	·
2. Reginae *Banks*	·	·	H	·
1, *Wit pisang*, *Wild banana*. 2, *Geel pisang*, *Bird-of-Paradise flower*.				
NAIADACEAE. Fl. Cap. vii, p. 41.				
Naias L. (l.c. 51)				
1. marina *L.*	G	·	·	·
ORCHIDACEAE. Fl. Cap. v, s. iii, p. 3.				
Acrolophia Pfitz. (l.c. 12)				
1. Bolusii *Rolfe*	G	*	*	·
2. capensis (*Berg.*) *Fourc.* [1]	G	K	H	U
3. cochlearis (*Lindl.*) *Schltr. & Bol.*	G	K	H	·
4. lunata *Schltr. & Bol.*	*	K	·	·
5. micrantha (*Lindl.*) *Schltr. & Bol.*	*	K	*	·
Angraecum Bory (l.c. 68)				
1. Burchellii *Reich. f.*	G	·	·	·
2. conchiferum *Lindl.*	·	K	*	·
3. pusillum *Lindl.*	*	K	H	·
4. sacciferum *Lindl.*	·	K	H	·
Tree orchids.				
Bartholina *R. Br.* (l.c. 94)				
1. Burmanniana (*L.*) *Ker* [2]	*	*	H	U
2. Ethelae *Bol.*	G	K	H	U
1, 2, *Spider orchid.*				

[1] A. tristis *Schltr. & Bol.* [2] B. pectinata *R. Br.* & B. Lindleyana *Reich. f.* [3] Gaugusta *Th.*

Bonatea Harv. (l.c. 138)				
Saundersiae (Harv.) Dur. & Sch.	*	*	*	·
1. speciosa (*L.f.*) *Willd.*	G	K	*	·
Brownleea Harv. (l.c. 259)				
1. recurvata *Sond.*	·	·	H	·
Calanthe R. Br. (l.c. 11)				
1. natalensis *Reich. f.*	·	K	H	·
Cerantandra Eckl. (l.c. 265, incl. **Ceratandropsis** Rolfe, l.c. 266)				
1. atrata (*L.*) *Dur. & Sch.*[1]	G	K	·	·
2. globosa *Lindl.*[2]	*	K	H	·
3. grandiflora *Lindl.*[3]	G	K	H	U
Corycium Sw. (l.c. 281)				
1. bicolorum (*Th.*) *Sw.*	G	K	·	·
2. carnosum (*Lindl.*) *Rolfe*	*	*	H	U
3. nigrescens *Sond.*	G	K	H	·
Cytorchis Schltr. (under **Listrostachys** Reich f., l.c. 74)				
1. arcuata (*Lindl.*) *Schltr.*[4] *A tree orchid.*	·	K	H	·
Disa Berg. (l.c. 210, incl. **Orthopenthea** Rolfe l.c. 179, **Monadenia** Lindl. l.c. 186, **Herschelia** Lindl. l.c. 199, **Forficaria** Lindl. l.c. 207 and **Penthea** Lindl. l.c. 208)				
1. aconitoides *Sond.*	G	*	H	·
2. auriculata *Bolus*[5]	*	*	H	·
3. barbata (*L.f.*) *Sw.*[6]	*	*	H	·
4. bivalvata (*L.f.*) *Dur. & Sch.*[7]	G	K	H	U
5. brevicornis (*Lindl.*) *Bolus*[8]	G	K	H	U
capricornis Reich. *f.*	*	*	*	·
6. cernua *Sw.*[9]	G	K	H	·
7. chrysostachya *Sw.*	G	K	H	U
8. comosa (*Reich. f.*) *Schltr.*[10]	G	·	·	U
9. cornuta (*L.*) *Sw.*	G	K	H	U
10. crassicornis *Lindl.*	·	·	H	·
11. cylindrica (*Th.*) *Sw.*	G	K	H	U
12. excelsa *Th.*[11]	G	*	H	U
13. fasciata *Lindl.*[12]	G	*	H	·
14. ferruginea (*Th.*) *Sw.*	G	·	·	·
15. filicornis (*L.f.*) *Th.*[13]	G	K	H	U
16. gladioliflora *Burch.*	·	K	H	U
17. glandulosa *Burch.*	*	*	H	U
18. graminifolia *Ker*[14]	*	K	H	·
19. lacera *Sw.*[15]	G	K	H	U
20. lugens *Bolus*[16]	*	*	*	U
21. micrantha (*Lindl.*) *Bolus*[17]	G	K	H	U
22. neglecta *Sond.*	G	·	·	·

[1] C. chloroleuca *Eckl.* [2] Ceratandropsis globosa *Rolfe.* [3] Ceratandropsis grandiflora *Rolfe.*
[4] Listrostachys arcuata *Reich. f.* [5] Monadenia auriculata *Rolfe.* [6] Herschelia barbata *Bolus.*
[7] Orthopenthea bivalvata *Rolfe.* [8] Monadenia brevicornis *Lindl.* [9] Monadenia prasinata *Lindl.*
[10] Monadenia comosa *Reich. f.* [11] Herschelia excelsa *Rolfe.* [12] Orthopenthea fasciata *Rolfe.*
[13] Penthea filicornis *Lindl.* [14] Herschelia coelestis *Lindl.* [15] Herschelia venusta *Kränzl.*
[16] Herschelia lugens *Kränzl.* [17] Monadenia micrantha *Lindl.*

23. Newdigatae *L. Bol.*[1]	·	K	H	·
24. obtusa *Lindl.*	*	*	H	·
25. ophrydea (*Lindl.*) *Bolus*	G	*	H	U
26. outeniquensis *Schltr.*	G	·	·	U
27. patens (*L.f.*) *Sw.*[2]	G	·	·	·
28. picta *Sond.*	G	*	H	·
29. polygonoides *Lindl.*	G	*	H	·
30. porrecta *Sw.*	·	·	H	U
31. racemosa *L.f.*	*	*	H	U
32. reticulata *Bolus*[3]	G	*	H	·
33. rosea *Lindl.*[4]	·	·	·	U
34. rufescens *Sw.*[5]	G	K	·	·
35. sagittalis (*L.f.*) *Sw.*	G	K	H	U
tenella (L.f.) Sw.	*	*	*	·
36. tenuicornis *Bolus*	G	·	·	·
37. tripartita *Lindl.*[6]	·	·	·	U
38. tripetaloides (*L.f.*) *N. E. Br.*	G	K	H	U
39. uncinata *Bolus*	G	*	H	U
40. vaginata *Harv.*	*	K	·	·
41. Vasselotii *Bolus*	·	K	H	U
42. venosa *Sw.*	·	K	H	U
18, *Blue Disa.*				
Disperis Sw. (l.c. 291)				
1. capensis (*L.f.*) *Sw.*	G	K	H	U
circumflexa (L.) *Dur. & Sch.*[7]	*	*	*	·
2. disaeformis *Schltr.*	*	K	*	·
3. MacOwani *Bolus*	G	*	*	·
4. paludosa *Harv.*	G	K	H	U
5. purpurata *Reich. f.*	·	·	H	·
villosa (L.f.) Sw.	*	*	*	·
Eulophia R. Br. (l.c. 17)				
1. capensis (*L.*) *Bolus*[8]	G	K	H	U
2. ensata *Lindl.*	·	·	·	U
3. hians (*L.f.*) *Spreng.*	G	K	H	·
4. litoralis *Schltr.*	*	K	·	·
5. platypetala *Lindl.*	*	K	·	·
6. rupestris *Reich. f.*	·	K	·	·
7. tabularis (*L.f.*) *Bolus*	*	*	H	·
8. violacea *Reich. f.*	·	K	*	U
Habenaria Willd. (l.c. 117)				
1. anguiceps *Bolus*	·	·	H	·
2. arenaria *Lindl.*	*	K	H	·
var. F. 4586	·	·	H	·
3. Dregeana *Lindl.*	·	K	*	·
4. falcicornis (*Burch.*) *Bolus*	G	K	H	·
foliosa (Sw.) Reich. f.	*	*	*	·

[1] Under Forficaria graminifolia *Lindl.* in Fl. Cap.
[2] Penthea patens *Rolfe.*
[3] Monadenia reticulata *Dur. & Sch.*
[4] Orthopenthea rosea *Rolfe.*
[5] Monadenia rufescens *Dur. & Sch.*
[6] Herschelia tripartita *Rolfe.*
[7] D. secunda *Sw.*
[8] E. aculeata *Spreng.*

5. Macowaniana *Kränzl.*	·	K	H	U
6. tetrapetala (*Krauss*) *Kränzl.*	·	K	*	·
Holothrix L. C. Rich. (l.c. 96)				
1. Burchellii (*Lindl.*) *Reich. f.*	G	*	H	U
2. condensata *Sond.*	*	*	H	·
3. exilis *Lindl.*	G	K	H	·
var. brachylabris (*Bolus*)	·	K	·	U
4. Lindleyana *Reich. f.*	*	K	H	U
5. Mundii *Sond.*	G	*	H	·
6. parvifolia *Lindl.*	*	K	*	·
7. pilosa (*Lindl.*) *Reich. f.*	*	*	H	U
8. Schlechteriana *Kränzl.*	·	·	H	·
9. squamulosa *Lindl.*	G	K	*	·
10. villosa *Reich. f.*	G	K	H	·
Liparis L. C. Rich. (l.c. 8)				
1. capensis *Lindl.*	*	K	H	·
Lissochilus R. Br. (l.c. 54)				
1. aequalis *Lindl.*	·	K	H	·
2. platypetalus *Lindl.*	·	·	H	U
3. speciosus *R. Br.*	·	·	H	·
4. streptopetalus *Lindl.*	·	·	H	·
Mystacidium Lindl. (l.c. 75)				
1. capense (*L.f.*) *Schltr.*[1]	·	K	H	·
A tree orchid.				
Platanthera L. C. Rich. (l.c. 88)				
1. Macowaniana (*Reich. f.*) *Schltr.*	G	K	H	·
Polystachya Hook. (l.c. 63)				
1. Ottoniana *Reich. f.*	·	K	H	·
A tree orchid.				
Pterygodium Sw. (l.c. 271)				
1. acutifolium *Lindl.*	G	K	*	U
2. alatum (*Th.*) *Sw.*	*	K	H	.
3. caffrum (*Th.*) *Sw.*	G	K	·	·
4. catholicum (*L.*) *Sw.*	G	*	*	U
cruciferum Sond.	*	*	*	·
5. Newdigatae *Bolus*	·	K	H	U
Satyrium Sw. (l.c. 145)				
1. acuminatum *Lindl.*	G	K	H	U
2. bicallosum *Th.*	G	*	H	·
3. bicorne (*L.*) *Th.*	G	·	·	U
4. Bowiei *Rolfe*	·	K	·	·
5. bracteatum (*L.f.*) *Th.*	*	K	H	·
6. candidum *Lindl.*	*	K	H	U
7. carneum *R. Br.*	*	K	H	·
8. coriifolium *Sw.*	G	K	H	·
9. cristatum *Sond.*	.	K	*	·
10. erectum *Sw.*	G	*	*	·
11. Hallackii *Bolus*	*	K	*	·

[1] M. filicorne *Lindl.*

12. ligulatum *Lindl.*	G	K	H	·
13. lupulinum *Lindl.*	G	*	H	·
14. maculatum *Burch.*	G	K	H	·
15. membranaceum *Sw.*	G	K	H	·
16. muticum *Lindl.*	*	K	·	·
17. outeniquense *Schltr.*	G	*	H	U
18. parviflorum *Sw.*	G	K	H	·
19. Pentherianum *Kränzl.*	·	·	H	·
20. pictum *Lindl.*	G	K	H	·
21. princeps *Bolus*	:	K	H	·
22. pygmaeum *Sond.*	G	·	·	·
23. retusum *Lindl.*	*	K	H	.
24. rupestre *Schltr.*	G	*	H	·
25. stenopetalum *Lindl.*	*	K	H	·
Schizodium Lindl. (l.c. 253)				
1. inflexum *Lindl.*	G	K	H	U
2. obliquum *Lindl.*	*	K	·	·
bifidum (Th.) Reich. f.[1]	*	*	*	·
Tridactyle Schltr. (under **Angraecum** Bory, l.c. 68)				
1. bicaudata (*Lindl.*) *Schltr.*[2]	·	K	H	·
A tree orchid.				
POTAMOGETONACEAE. Fl. Cap. vii, p. 41 (under NAIADACEAE).				
Althenia Petit				
1. filiformis *Petit* †	·	·	H	·
Potamogeton L. (l.c. 45)				
Friesii Rupr.	*	*	*	.
1. lucens *L.* †	·	K	*	·
natans L. †	*	*	*	.
2. nodosus *Poir.*[3]	*	K	H	U
2, *Pondweed.*				
Ruppia L.				
1. rostellata *Koch* †	.	.	H	·
Zostera L. (l.c. 50)				
1. capensis *Setchell*[4]	·	K	H	·
Sea grass, Seegras.				
RESTIONACEAE. N. S. Pillans in Tr. Roy. Soc. S. Afr. xvi, p. 207 (1928).				
Cannamois Beauv. (l.c. 410)				
1. Dregei *Pillans*	G	·	·	U
2. virgata (*Rottb.*) *Steud.*[5]	*	K	H	U
Chondropetalum Rottb. (l.c. 297)				
1. microcarpum (*Kunth*) *Pillans*	*	*	H	·
tectorum (L.f.) Pillans[6]	*	*	*	·

[1] S. rigidum *Lindl.* [2] Angraecum bicaudatum *Lindl.* [3] P. americanus *Cham.*
[4] Z. marina var. angustifolia *Horn.* [5] C. cephalotes *Beauv.* [6] Dovea tectorum *Mast.*

Elegia L. (l.c. 313)				
1. asperiflora (*Nees*) *Kunth*	*	*	H	U
2. coleura *Nees*	*	*	H	·
3. equisetacea *Mast.*	G	K	H	·
4. fistulosa *Kunth*	*	K	H	·
5. juncea *L.*	G	*	H	U
6. Neesii *Mast.*	*	K	·	·
7. parviflora *Kunth*	G	K	*	U
8. racemosa (*Poir.*) *Pers.*[1]	G	*	*	·
9. thyrsifera *Pers.*	*	*	H	·
10. thyrsoidea (*Mast.*) *Pillans*[2]	G	·	·	U
vaginulata Mast.	*	*	*	·
11. verticillaris (*L.f.*) *Kunth*	G	K	H	U
Hypodiscus Nees (l.c. 399)				
1. albo-aristatus (*Nees*) *Mast.*	G	K	H	U
2. argenteus (*Th.*) *Mast.*	*	K	·	·
3. aristatus (*Th.*) *Nees*	G	K	H	U
4. striatus (*Kunth*) *Mast.*	G	K	H	U
5. synchroolepis (*Steud.*) *Mast.*	·	K	H	·
6. Willdenowia (*Nees*) *Mast.*	*	K	·	·
Hypolaena R. Br. (l.c. 390)				
1. anceps *Mast.*	G	·	·	·
2. purpurea *Pillans*	*	*	H	U
Leptocarpus R. Br. (l.c. 342)				
1. Burchellii *Mast.*	G	·	·	·
2. paniculatus (*Rottb.*) *Mast.*	G	K	H	U
vimineus (Rottb.) Pillans[3]	*	*	*	·
2, *Bezemgoed.*				
Restio L. (l.c. 210)				
1. callistachyus *Kunth*	G	K	H	U
2. compressus *Rottb.*	G	*	H	·
3. cuspidatus *Th.*	*	*	H	U
4. debilis *Nees*	*	K	·	·
5. Eleocharis *Nees*	*	K	*	·
6. filiformis *Poir.*	*	K	·	U
7. Fourcadei *Pillans*	G	*	H	U
8. fruticosus *Th.*[4]	G	K	H	U
9. giganteus (*Kunth*) *N. E. Br.*[5]	G	K	H	U
10. Helenae *Mast.*	G	·	·	·
11. hystrix *Mast.*	*	K	·	·
12. leptoclados *Mast.*	G	K	H	·
13. Rhodocoma *Mast.*	·	·	H	·
14. scaberulus *N. E. Br.*	G	·	·	·
15. strictus *N. E. Br.*	G	·	·	·
16. tetragonus *Th.*	G	K	H	·
17. triflorus *Rottb.*	*	K	*	·

[1] E. fusca *N. E. Br.* [2] Dovea thyrsoidea *Mast.* [3] Restio pauciflorus *Poir.*
[4] Leptocarpus modestus *Mast.* [5] Thamnochortus giganteus *Kunth* and R. comosus *N. E. Br.*

18. triticeus *Rottb.*	G	K	H	U
9, *Olifantsriet.* 18, *Bezemriet.*				
Thamnochortus Berg. (l.c. 358)				
1. argenteus *Kunth*	*	K	H	U
2. erectus (*Th.*) *Mast.*	G	K	H	·
fruticosus Berg.	*	*	*	·
3. glaber *Pillans*[1]	·	K	H	·
4. spicigerus *Th.*	*	K	·	·
2, *Jakkalsstert.*				
Willdenowia Th. (l.c. 419)				
1. teres *Th.*[2]	*	K	H	U
TYPHACEAE. Fl. Cap. vii, p. 30.				
Typha L. (l.c. 31)				
australis Schum.	*	*	*	·
1. capensis *Rohrb.*	*	*	H	·
1, *Bulrush.*				
XYRIDACEAE. Fl. Cap. vii, p. 2.				
Xyris L. (l.c. 3)				
1. capensis *Th.*	*	*	H	·

[1] T. fruticosus var. glaber *Mast.* [2] Incl. W. fraterna *N.E. Br.*, and W. Galpini *N. E. Br.*

ADDENDA.

AIZOACEAE.				
Lampranthus N. E. Br.				
9. prominulus (*L. Bol.*) *L. Bol.*[3]	G	·	·	·
COMPOSITAE.				
Hippia L.				
3. montana *Compton*	·	·	·	U
CRASSULACEAE.				
Bryophyllum Salisb.				
1. tubiflorum *Harv.*	·	·	H	U
ERICACEAE.				
Blaeria L.				
3. grandis *N. E. Br.*	·	·	H	·
Erica L.				
111. humifusa *Hibbert*	·	·	·	U
112. Krigeae *Compton*	·	·	·	U
Simocheilus Kl.				
4. pubescens *Kl.*	·	·	·	U

[3] Mesembryanthemum prominulum *L. Bol.*

EUPHORBIACEAE.				
Euphorbia L.				
27. livida *E. Mey.* ....†	.	.	H	.
LEGUMINOSAE.				
Coelidium Vog.				
1. Fourcadei *Compton*	G	.	.	U
Desmodium Desv.				
1. Scalpe (*Comm.*) *DC.*	.	K	.	.
PROTEACEAE.				
Mimetes Salish.				
5. palustris *Knight*	.	.	.	U
Spatallopsis Phillips.				
1. confusa *Phillips*	.	.	.	U
RHAMNACEAE.				
Phylica L.				
21. Meyeri *Sond.*	.	.	.	U
22. tortuosa *E. Mey*	.	.	.	U
SANTALACEAE.				
Thesium L.				
31. Hollandii *Compton*	.	.	.	U
SCROPHULARIACEAE.				
Sutera Roth.				
25. rhombifolia *Schinz*	.	.	H	.
UMBELLIFERAE.				
Cnidium Cuss.				
1. suffruticosum (*Berg.*) *Ch. & Schl.*	*	K	H	.
Daucus L.				
1. Carota *L.* ....†	*	*	H	U
Wild Carrot.				
Foeniculum Adans.				
1. officinale *Allm.* ....†	*	*	H	.
Venkel, Fennel.				
Hermas L.				
1. uitenhagensis *E. & Z.*	.	.	.	U
Heteromorpha Ch. & Schl.				
1. arborescens (*L.*) *Ch. & Schl.*	G	K	H	.
GRAMINEAE.				
Spartina Schreb.				
1. stricta (*Ait.*) *Roth*	.	K	*	.

HAEMODORACEAE.				
Dilatris Berg.				
1. ixioides *Lam.*	G	.	.	.
IRIDACEAE.				
Bobartia Ker				
9. paniculata *Lewis*	.	.	.	U
Watsonia Miller				
14. Starkeae *L. Bol*	.	.	.	U

NAME CHANGES.

The following changes have been made by Miss G. J. Lewis in Journ. S.A. Bot., Jan., 1941, p. 19 :—

Acidanthera brevicollis *Bak.* to Gladiolus sabulosus *Lewis*

A. Fourcadei *L. Bol.* to Geissorhiza Fourcadei (*L. Bol.*) *Lewis*

A. roseo-alba *Lewis* to Engysiphon roseo-albus (*Lewis*) *Lewis*

and by Adamson and Sprague in Journ. S.A. Bot., April 1941, p. 89 :—

Demazeria brachystachya *Phillips* to Plagiochloa brachystachya (*Nees*) *Adams. et Sprague*

D. capensis *Hack.* to P. Uniolae (*L.f.*) *Adams. et Sprague*

Dr. L. Bolus communicates the following :—

Bergeranthus stenophyllus *Schw.* should be Ruschia stenophylla (*L. Bol.*) *L. Bol. ms.*

Delosperma macrorhizum *Schw.* is Mestoklema tuberosum (*Haw.*) *N.E. Br.* var. macrohizum (*N.E. Br.*)

RECAPITULATION.

	Species.			Species.	
	Native.	Alien.		Native.	Alien.
GYMNOSPERMAE.			Leguminosae..........	194	11
			Lentibulariaceae.......	2	—
Cupressaceae..........	2	—	Linaceae..............	4	—
Cycadaceae...........	1	—	Loganiaceae...........	6	—
Podocarpaceae.........	2	—	Loranthaceae..........	4	—
			Lythraceae............	1	1
DICOTYLEDONES.			Malvaceae............	19	1
			Meliaceae.............	4	—
Acanthaceae..........	26	—	Melianthaceae.........	2	—
Achariaceae...........	1	—	Menispermaceae.......	2	—
Aizoaceae.............	109	—	Moraceae.............	2	—
Amarantaceae.........	4	—	Myoporaceae..........	1	—
Ampelidaceae.........	5	—	Myricaceae............	10	—
Anacardiaceae.........	21	—	Myrsinaceae...........	3	—
Apocynaceae..........	7	1	Nymphaeaceae........	1	—
Aquifoliaceae..........	1	—	Ochnaceae.............	2	—
Araliaceae............	4	—	Oleaceae..............	8	—
Asclepiadaceae........	48	2	Oliniaceae.............	1	—
Basellaceae...........	—	1	Onagraceae...........	2	5
Balsaminaceae.........	1	—	Orobanchaceae........	1	—
Bignoniaceae..........	2	1	Oxalidaceae...........	23	—
Boraginaceae..........	15	4	Papaveraceae..........	1	1
Bruniaceae............	9	—	Passifloraceae.........	—	2
Cactaceae.............	—	2	Penaeaceae...........	6	—
Campanulaceae........	55	—	Phytolaccaceae........	3	1
Capparidaceae.........	4	—	Piperaceae............	3	—
Caryophyllaceae.......	17	6	Pittosporaceae.........	1	—
Celastraceae...........	26	—	Plantaginaceae........	3	3
Ceratophyllaceae.......	—	1	Plumbaginaceae.......	3	—
Chenopodiaceae........	12	8	Polygalaceae..........	41	—
Compositae...........	410	18	Polygonaceae..........	10	5
Convolvulaceae........	15	2	Portulacaceae.........	3	1
Cornaceae.............	1	—	Primulaceae...........	3	3
Crassulaceae..........	73	—	Proteaceae............	59	2
Cruciferae.............	27	7	Ranunculaceae........	13	—
Cucurbitaceae.........	10	—	Resedaceae............	2	—
Cunoniaceae...........	2	—	Rhamnaceae..........	25	—
Dipsaceae.............	2	—	Rosaceae.............	24	1
Droseraceae...........	3	—	Rubiaceae............	21	1
Ebenaceae.............	14	—	Rutaceae.............	60	1
Elatinaceae...........	1	—	Salicaceae............	1	1
Ericaceae.............	132	—	Salvadoraceae.........	1	—
Euphorbiaceae.........	57	4	Samydaceae...........	2	—
Flacourtiaceae.........	5	—	Santalaceae...........	37	—
Frankeniaceae.........	1	—	Sapindaceae...........	6	—
Fumariaceae..........	3	1	Sapotaceae............	1	—
Gentianaceae..........	26	—	Saxifragaceae..........	1	—
Geraniaceae...........	74	1	Scrophulariaceae.......	89	5
Gesneriaceae..........	1	—	Selaginaceae...........	37	—
Goodeniaceae..........	1	—	Solanaceae............	22	6
Grubbiaceae...........	2	—	Sterculiaceae..........	25	—
Halorrhagidaceae......	2	1	Thymelaeaceae........	56	—
Hamamelidaceae.......	2	—	Tiliaceae..............	2	—
Hypericaceae..........	2	—	Ulmaceae.............	1	—
Icacinaceae...........	3	—	Umbelliferac..........	36	3
Labiatae..............	32	4	Urticaceae............	5	2
Lauraceae.............	2	—	Valerianaceae.........	1	—

	Species.			Species.	
	Native.	Alien.		Native.	Alien.
Verbenaceae	3	1	Gramineae	105	34
Violaceae	1	1	Haemodoraceae	4	—
Zygophyllaceae	6	1	Hydrocharitaceae	2	—
			Iridaceae	132	—
			Juncaceae	11	—
MONO-			Juncaginaceae	3	—
COTYLEDONES.			Lemnaceae	1	1
			Liliaceae	201	—
Amaryllidaceae	38	—	Musaceae	2	—
Aponogetonaceae	3	—	Naiadaceae	1	—
Araceae	1	—	Orchidaceae	133	—
Cannaceae	—	1	Potamogetonaceae	2	3
Commelinaceae	3	—	Restionaceae	47	—
Cyperaceae	92	5	Typhaceae	1	—
Dioscoreaceae	5	—	Xyridaceae	1	—

	Native.	*Alien.*
Gymnospermae	5	—
Dicotyledones	2,176	127
Monocotyledones	788	39
TOTALS	2,969	166

ANALYSIS—NATIVE SPECIES.

	Number.	Percentage.		Number.	Percentage.
Compositae	410	13·9	Selaginaceae	37	1·2
Liliaceae	201	6·8	Santalaceae	37	1·2
Leguminosae	194	6·6	Umbelliferae	36	1·1
Orchidaceae	133	4·5	Labiatae	32	1·1
Ericaceae	132	4·4	Cruciferae	27	0·9
Iridaceae	132	4·4	Celastraceae	26	0·9
Gramineae	105	3·5	Acanthaceae	26	0·9
Aizoaceae	109	3·7	Gentianaceae	26	0·9
Cyperaceae	92	3·1	Oxalidaceae	23	0·8
Scrophulariaceae	89	3·0	Sterculiaceae	25	0·8
Geraniaceae	74	2·5	Rosaceae	24	0·8
Crassulaceae	73	2·4	Rhamnaceae	25	0·8
Rutaceae	60	2·0	Solanaceae	22	0·7
Euphorbiaceae	57	2·0	Anacardiaceae	21	0·7
Proteaceae	59	2·0	Rubiaceae	21	0·7
Thymelaeaceae	56	1·9	8 Families of 20 to 11 spp. each	116	3·9
Campanulaceae	55	1·9			
Asclepiadaceae	48	1·7	56 Families of 10 to 2 spp. each	212	7·2
Restionaceae	47	1·6			
Polygalaceae	41	1·4	28 Families of 1 sp. each	28	0·9
Amaryllidaceae	38	1·3			
			TOTAL	2,969	

GENERA REPRESENTED BY 20 SPECIES, OR MORE.

Erica	112	Euphorbia	27
Pelargonium	69	Oxalis	23
Senecio	66	Hermannia	25
Crassula	52	Satyrium	25
Helichrysum	49	Psoralea	24
Aspalathus	47	Sutera	24
Disa	42	Ficinia	25
Indigofera	33	Aster	22
Agathosma	33	Selago	21
Thesium	31	Lobelia	20
Haworthia	31	Muraltia	20
Gnidia	27	Phylica	22

ADDITIONS TO FLORA CAPENSIS, Harvey and Sonder, AND CONTINUATION.

DICOTYLEDONES.

AIZOACEAE.

Aridaria Fourcadei *L. Bol.* in Notes on Mesemb. etc., pt. ii, 69 (1929).
A. primulina *L. Bol.* in Notes Mes., pt. ii, 26 (1928).
Bergeranthus vespertinus *Schw.* in Zeitschr. f. Zukk. (1928), 180.
Carpobrotus deliciosus *L. Bol.* in Ann. Bol. Herb. iii, 109 (1924).
C. dulcis *L. Bol.* in Notes Mes. pt. ii, 48 (1929).
C. Fourcadei *L. Bol.* in Ann. Bol. Herb. 4, 109 (1927).
Conicosia Bijlii *N. E. Br.* in Gard. Chr. 41, 121 (1931).
Cryophytum intermedium *L. Bol.* in Notes Mes. pt. ii, 53 (1929).
Delosperma inconspicuum *L. Bol.* in Notes Mes. pt. i, 152.
D. multiflorum *L. Bol.* in Notes Mes. pt. i, 151 (1928).
Drosanthemum Edwardsiae *L. Bol.* in Notes Mes. pt. ii, 321 (1932).
D. gracillimum *L. Bol.* in Notes Mes. pt. ii, 197 (1930).
D. Vandermerwei *L. Bol.* in Notes Mes. pt. ii, 139 (1929).
Faucaria uniondalensis *L. Bol.* in Notes Mes. pt. iii, 106 (1937).
Glottiphyllum Muirii *N. E. Br.* in Gard. Chr. 82, 290, 489 (1927).
G. propinquum *N. E. Br.* in Kew Bull. (1929) 57.
G. Starkae *L. Bol.* in Notes Mes. pt. ii, 404 (1933).
G. uniondalense *L. Bol.* in Notes Mes. pt. ii, 362 (1932).
Gibbaeum Helmiae *L. Bol.* in Notes Mes. pt. ii, 402 (1933).
Hereroa gracilis var. compressa *L. Bol.* in Notes Mes. pt. ii, 268 (1931).
H. granulata *Dint. & Schw.* in Zeitschr. f. Zukk. (1927) 24.
Mesembryanthemum albiflorum *L. Bol.* in Ann. Bol. Herb. 4, 82 (1927).
M. calandrum *L. Bol.* in Ann. Bol. Herb. 4, 7 (1925).
M. cymosum *L. Bol.* in Ann. Bol. Herb. 3, 170 (1924).
M. dependens *L. Bol.* in Ann. Bol. Herb. 3, 134 (1922).
M. Duthiae *L. Bol.* in Ann. Bol. Herb. 3, 162 (1924).
M. Fourcadei *L. Bol.* in Ann. Bol. Herb. 4, 72 (1927).
M. Haeckelianum *Berger* in Engl. Bot. Jahr. 45, 224 (1910).
M. integrum *L. Bol.* in Ann. Bol. Herb. 3, 134 (1922)
M. intermedium *L. Bol.* in Ann. Bol. Herb. 3, 171 (1924).
M. knysnana *L. Bol.* in Ann. Bol. Herb. 4, 97 (1927).
M. Lavisii *L. Bol.* in Notes Mes. pt. ii, 156 (1929).
M. litorale *L. Bol.* in Tr. Roy. Soc. S. Afr. 1, 153 (1909).
M. macrosepalum *L. Bol.* in Notes Mes. pt. ii, 219 (1930).
M. Muirii *L. Bol.* in Ann. Bol. Herb. 3, 138 (1922).
M. mutans *L. Bol.* in Notes Mes. pt. ii, 18 (1928).
M. pauciflorum *L. Bol.* in Ann. Bol. Herb. 4, 90 (1927).
M. Patersoniae *L. Bol.* in Ann. Bol. Herb. 2, 30 (1916).
M. productum var. purpureum *L. Bol.* in Notes Mes. pt. ii, 43 (1929).
M. prominulum *L. Bol.* in Notes Mes. pt. ii, 408 (1933).
M. stenophyllum *L. Bol.* in Ann. Bol. Herb. 4, 1 (1925).
M. sobrinum *N. E. Br.* in Kew Bull. 1929, p. 60.
M. subaequale *L. Bol.* in Notes Mes. pt. iii, 56 (1937).
Machairophyllum acuminatum *L. Bol.* in Notes Mes. pt. ii, 485 (1934).
M. Baxteri *L. Bol.* in Notes Mes. pt. ii, 486 (1934).
Pleiospilos brevisepalus *L. Bol.* in Notes Mes. pt. ii, 255 (1931).

P. Kingiae *L. Bol.* in Notes Mes. pt. iii, 33 (1936).
P. Leipoldtii *L. Bol.* in Notes Mes. pt. ii, 278 (1931).
Psilocaulon Levynsiae *N. E. Br.* in Gard. Chr. 1928, p. 254.
P. Lewisiae *L. Bol.* in Notes Mes. pt. ii, 492 (1934).
P. Pageae *L. Bol.* in Ann. Bol. Herb. 3, 163 (1924).
P. Rogersiae *L. Bol.* in Notes Mes. pt. ii, 30 (1928).
P. utile *L. Bol.* in Notes Mes. pt. ii, 157 (1929).
Ruschia Fourcadei *L. Bol.* in Notes Mes. pt. ii, 46 (1929).
R. Maxwellii *L. Bol.* in Notes Mes. pt. ii, 107 (1929).
R. spinescens *L. Bol.* in Notes Mes. pt. ii, 175 (1930).
R. knysnana var. angustifolia *L. Bol.* in Notes Mes. pt. i, 146 (1928).
Trichodiadema Fourcadei *L. Bol.* in Notes Mes. pt. i, 138 (1928).

ANACARDIACEAE.

Rhus outeniquensis *Szyszy.* in Plantae Rehm. pt. 2, 52 (1888).
R. Schlechteri *Diels* in Engl. Jahr. 24, 501.

APOCYNACEAE.

Vinca major *L.* Europe. Introduced.

ASCLEPIADACEAE.

Araujia sericifera *Brot.* Peru. Introduced.
Huernia Eustacei *Pillans* ms.
Stapelia Bijliae *Pillans* in White & Sloane's Stapeliae, v. 2, p. 674 (1937).

CACTACEAE.

Opuntia aurantiaca *Gilles.* Chili. Introduced.
O. streptocantha *Lemaire.* Mexico. Introduced.

CAMPANULACEAE.

Laurentia longiflora *Schltr.* in Engl. Bot. Jahr. 57, 625 (1922).
Lobelia dichroma *Schltr.* in Engl. Jahr. 57, 623 (1922).
L. ardisandroides *Schltr.* in Engl. Jahr. 57, 623 (1922).
L. sylvatica *Fourc.* in Tr. Roy. Soc. S. Afr. 21, 82 (1932).
Prismatocarpus Rogersii *Fourc.* in Tr. Roy. Soc. S. Afr. 31, 83 (1932).
P. virgatus *Fourc.* in Tr. Roy. Soc. S. Afr. 21, 83 (1932).
Wahlenbergia Guthriei *L. Bol.* in Ann. Bol. Herb. i, 193 (1915).
W. polychotoma *v. Brehmer* in Engl. Jahr. 53 (1915).

CARYOPHYLLACEAE.

Dianthus Bolusii *Burtt-Davy* in Kew Bull. 1922, p. 218.

CELASTRACEAE.

Celastrus maritimus *Bol.* in Journ. L. Soc. 24, 173 (1887).
Gymnosporia crataegiflora *Davison* in Bothalia ii, 314 (1927).

CHENOPODIACEAE.

Arthrocnemum heptiflorum *Moss* ms.
A. Pillansii *Moss* ms.

COMPOSITAE.

Anaglypha acicularis *Benth.* in Hook. Ic. Pl. t. 1109 (1876).
Anthemis Cotula L. Europe, N. Africa, Orient. Introduced.
Arctotis speciosa (*Jacq.*) s. sp. Hayana *Stapf & C. A. Smith* in Bot. Mag. t. 9247.
Aster exilis *Ellm.* N. America. Introduced.
A. outeniquae *Fourc.* in Tr. Roy. Soc. S. Afr. 21, 84 (1932).
A. subulatus *Michx.* N. America. Introduced.
A. venustus *Fourc.* in Tr. Roy. Soc. S. Afr. 21, 85 (1932).
A. Westiae *Fourc.* in Tr. Roy. Soc. S. Afr. 21, 85 (1932).
Carduus tenuiflorus *Curtis.* Europe. Introduced.
Corymbium Fourcadei *Hutch.* in Kew Bull. 10, 1932, p. 510.
Disparago rosea *Hutch.* in Kew. Bull. 10 (1932), p. 511.
Erigeron linifolium *Willd.* Europe. Introduced.
Eriocephalus tenuipes *C. A. Smith* in Kew Bull. 1931, p. 101.
Galinsoga parviflora *Cav.* Trop. America. Introduced.

Gerbera Lynchii *Dümmer* in Journ. R. Hort. Soc. 40, 242 (1914).
Helichrysum panduratum *O. Hoffm.*
H. vellereum *R. A. Dyer* in Kew Bull. 1934, p. 266.
Hippia montana *Compton* in Journ. S.A. Bot. 6, 68 (1940).
Hypochoeris radicata *L.* Europe. Introduced.
Metalasia Cooperi *Hutch.* ms.
M. gemmulifera *Hutch.* ms.
M. lasiocephala *Hutch.* ms.
M. pallida *Bol.* in Tr. S. Afr. Phil Soc. 16, 384 (1906).
Osteospermum decumbens *Fourc.* in Tr. Roy. Soc. S. Afr. 21, 87 (1932).
Picris echioides *L.* Europe and N. Africa. Introduced.
Relhania Patersoniae *L. Bol.* in Ann. Bol. Herb. i, 191 (1915).
R. rigida *Hoffm. & Muschl.* in Ann. K. K. Nat. Hist. Hof. Mus. 24, 318 (1910).
Senecio dissidens *Fourc.* in Tr. Roy. Soc. S. Afr. 21, 87 (1932).
S. dumosus *Fourc.* in Tr. R. Soc. S. Afr. 21, 88 (1932).
S. litorosus *Fourc.* in Tr. R. Soc. S. Afr. 21, 88 (1932).
S. speciosus *Willd.* in Sp. Pl. iii, pt. 3, 1991 (1804).
Stoebe Burchellii *Levyns* in Journ. S. Afr. Bot. iii, 17 (1937).
S. Ensori *Compton* in Kew. Bull. 1934, p. 259.
Ursinia Bolusii *Thell.* in Mitt. Bot. Müs. Univ. Zür. 66, 249 (1921).
Tagetes minuta *L.* Trop. America. Introduced.
Tripteris Bolusii *Compton* in Tr. R. Soc. S. Afr. 19, 324 (1931).
T. glabra var. glandulosa *C. A. Smith* in Bothalia ii, 362 (1927).

CONVOLVULACEAE.

Cuscuta alpestris *Fourc.* in Tr. R. Soc. S. Afr. 21, 89 (1932).

CRASSULACEAE.

Adromischus leucothrix *C. A. Smith* in Bothalia, 3, 637 (1939).
Cotyledon Deasii *Schonl.* in Rec. Alb. Mus. iii, 140 (1915).
C. flavida *Fourc.* in Tr. R. Soc. S. Afr. 21, 91 (1932).
Crassula fastigiata *Schonl.* in Tr. R. Soc. S. Afr. 17, 261 (1929).
C. Fergusoniae *Schonl.* in Tr. R. Soc. S. Afr. 17, 278 (1929).
C. Kuhnii *Schonl.* in Rec. Alb. Mus. i, 114 (1904).
C. papillosa *Schonl. & Bak. f.* in Journ. Bot. 36, 371 (1898).
C. punctulata *Schonl. & Bak. f.* in Journ. Bot. 36, 362 (1898).
C. Rattrayi *Schonl. & Bak. f.* in Journ. Bot. 40, 290 (1902).
C. Smutsii *Schonl.* in Tr. R. Soc. S. Afr. 17, 265 (1929).
Dinacria sebaeoides *Schonl.* in Bull. Herb. Boissier 5, 860 (1897).

CRUCIFERAE.

Heliophila cornigera *Fourc.* in Tr. R. Soc. S. Afr. 21, 90 (1932).
H. Schlechteri *Schinz* in Vierteljahrsschr. Nat. Ges. Zür. 55, 235 (1910).

CUCURBITACEAE.

Kedrostis Schlechteri *Cogn.* in Bull. Herb. Boiss. ser. ii, 6, 829 (1906).
Peponia Mackenii *Naudin* in Ann. Sc. Nat. ser. v, 5, 29 (1866).

ERICACEAE.

Acrostemma Fourcadei *L. Guthrie* in Ann. Bol. Herb. 4, 22 (1925).
Erica coronanthera *Compton* in Journ. S. Afr. Bot. i, 37 (1935).
E. cyathiformis var. orientalis *L. Bol.* in Ann. Bol. Herb. 4, 19 (1925).
E. Fourcadei *L. Bol.* in Kew Bull. 1933, p. 185.
E. humansdorpensis *Compton* in Journ. S. Afr. Bot. i, 38 (1935).
E. Keetii *L. Bol.* in Kew Bull. 1933, p. 186.
E. manifesta *Compton* in Journ. S. Afr. Bot. i, 37 (1935).
E. inconstans *Zahlbr.* in Ann. K. K. Nat. Hofmus. 1898, p. 362.

GERANIACEAE.

Pelargonium Gilgianum *Schltr. ex Kunth* in Engl. Jahr. 40, 76 (1907).
P. gracillimum *Fourc.* in Tr. R. Soc. S. Afr. 21, 91 (1932).
P. hermansdorpense *R. Kunth* in Fedde, Rep. 28, 90 (1930).
P. mollicomum *Fourc.* in Tr. R. Soc. S. Afr. 21, 92 (1932).
P. Patersoni *R. Kunth* in Fedde, Rep. 15, 136 (1918).
P. uniondalense *R. Kunth* in Fedde, Rep. 15, 135 (1918).

LABIATAE.

Marrubium vulgare *L.* S. Europe, Orient, N. & S. America. Introduced.
Salvia Muirii *L. Bol.* in Journ. Bot. 1930, p. 103.

LEGUMINOSAE.

Acacia Cyclops *A. Cunn.* Australia. Introduced.
Albizzia lophantha *Benth.* Australia. Introduced.
Argyrolobium stenorrhizon *Oliver* in Hook. Ic. Pl. 16, t. 1525 (1886).
Aspalathus carinata *S. Garabedian* ms.
A. gracilis *S. Garab.* ms.
A. kougaensis *S. Garab.* ms.
Coelidium Fourcadei *Compton* in Journ. S.A. Bot. 6, 55 (1940).
Cyclopia aurea *Fourc.* in Tr. R. Soc. S. Afr. 21, 92 (1932).
Indigofera Duthieae *Bak. f.* ms.
I. glabella *Fourc.* in Tr. R. Soc. S. Afr. 21, 93 (1932).
I. grisophylla *Fourc.* in Tr. R. Soc. S. Afr. 21, 93 (1932).
I. Pappei *Fourc.* in Tr. R. Soc. S. Afr. 21, 94 (1932).
I. rhodantha *Fourc.* in Tr. R. Soc. S. Afr. 21, 94 (1932).
Lotononis flava *Dümmer* in Tr. R. Soc. S. Afr. 3, 321 (1913).
Medicago Aschersoniana *Urban.* N. Africa. Introduced.
Psoralea heterosepala *Fourc.* in Tr. R. Soc. S. Afr. 21, 95 (1932).
P. Keetii *Schonl.* in Bothalia 3, 130 (1930).
Rhynchosia Harmsiana var. Burchellii *Burtt-Davy* in Kew Bull, 1921, p. 193.
Vicia tetrasperma *Moench.* Europe. Introduced.
Vigna debilis *Fourc.* in Tr. R. Soc. S. Afr. 21, 96 (1932).

LOGANIACEAE.

Buddleia pulchella *N. E. Br.* in Kew Bull, 1894, p. 389.

MALVACEAE.

Malvastrum Burchellii *Bak. f.* in Journ Bot. 29, 166 (1891).
M. trilobatum *Bak. f.* in Journ. Bot. 29, 164 (1891).

ONAGRACEAE.

Oenothera striata *Led.* Hab. ? Introduced.
Xylopleurum roseum (*Ait.*) *Raim.* Hab. ? Introduced.

OXALIDACEAE.

Oxalis Fergusoniae *Salter* in Journ. S. Afr. Bot. 3, 96 (1937).
O. Fourcadei *Salter* in Journ. S. Afr. Bot. 2, 52 (1936).
O. georgica *Bol. f.* in Ann. Bol. Herb. 2, 20 (1916).
O. pendulifolia *Salter* in Journ. S. Afr. Bot. 5, 67 (1939).
O. sublanata *R. Kunth* in Bot. Jahr. Beibl. 21 (1927).
O. vestita *R. Kunth* in Bot. Jahr. Beibl. 22 (1927).
O. vigilans *L. Bol.* in Journ. Bot. 1930, p. 76.

PASSIFLORACEAE.

Passiflora caerulea *L.* Brazil. Introduced.
P. quadrangularis *L.* Trop. America. Introduced.

PLANTAGINACEAE.

Plantago litoraria *Fourc.* in Tr. R. Soc. S. Afr. 21, 96 (1932).
P. virginica *L.* N. America. Introduced.

POLYGALACEAE.

Muraltia Cynara *Chod.* in Vierteljahrsschr. Nat. Ges. Zür. 61, 611 (1916).
M. ericoides *Chod.* in V. Nat. Ges. Zür. 61, 615 (1916).
M. exappendiculata *Chod.* in V. Nat. Ges. Zür. 61, 612 (1916).

RANUNCULACEAE.

Clematis incisodentata *A. Rich.* in Tent. fl. Abyss. i, 2 (1847).
Knowltonia brevistylis *Szyszy.* in Polyp. Rehmann. 99 (1887).
K. canescens *Szyszy.* in Polyp. Rehmann. 7 (1887).
K. glabricarpellata *Huth.* in Bull. Herb. Boiss. iv, 423 (1896).
K. rotundifolia *Huth.* in Saml. Nat. Vörtr. 3, 70 (1890).

RHAMNACEAE.

Phylica alba *Pillans* ms.
P. confusa *Pillans* ms.
P. Fourcadei *Pillans* ms.
P. karroica *Pillans* ms.
P. Keetii *Pillans* ms.
P. lachnaeoides *Pillans* ms.

RUBIACEAE.

Carpacoce vaginellata *Salter* in Journ. S. Afr. Bot. 3, 113 (1937).

RUTACEAE.

Acmadenia barosmoides *Dümmer* in Journ. Bot. 1913, p. 221.
A. gracilis *Dümmer* in Fedde, Rep. 11, 163 (1912).
Agathosma acutisissima *Dümmer* in Fedde, Rep. 11, 332 (1912).
A. cryptocarpa *Fourc.* in Tr. R. Soc. S. Afr. 21, 98 (1932).
A. Dielsiana *Schltr. ex Dümmer* in Fedde, Rep. 11, 333 (1912).
A. Keetii *Dümmer* in Ann. Bol. Herb. 3, 52 (1923).
A. Muirii *Phillips.*
A. phylicoides *Fourc.* in Tr. R. Soc. S. Afr. 21, 98 (1932).
A. Rehmanniana *Dümmer* in Fedde, Rep. 11, 336 (1912).
A. sessilipetala *Dümmer* in Fedde Rep. 11, 337 (1912).
A. Sonderiana *Dümmer* in Ann. Bol. Herb. iii, 50 (1923).
A. Taskerae *Dümmer* in Fedde, Rep. 11, 402 (1912).
Barosma unicarpellata *Fourc.* in Tr. R. Soc. S. Afr. 21, 98 (1932).
Citrus medica *L.* Trop. Asia. Introduced.
Fagara Davyi *Verdoorn* in Journ. Bot. 62, 203 (1919).

SANTALACEAE.

Thesium Hollandii *Compton* in Journ. S.A. Bot. 6, 68 (1940).

SAPINDACEAE.

Atalaya capensis *R. A. Dyer* in S. Afr. Journ. Sc. 34, 214 (1937).

SCROPHULARIACEAE.

Diclis ovata *Benth.* in Comp. Bot. Mag. 2, 23.
Nemesia elata *Grant* ms.
N. Fourcadei *Grant* ms.
Phyllopodium linearifolium *Bolus* in Tr. S. Afr. Phil. Soc. 16, 398 (1908).
Sutera atrocaerulea *Fourc.* in Tr. R. Soc. S. Afr. 21, 100 (1932).
S. rhombifolia *Schinz* in Vierteljahrs. d. Nat. Ges. in Zür., 74, 117 (1929).
Veronica agrestis L. Europe. Asia. Introduced.
V. chamaedrys *L.* Europe. W. Asia. Introduced.
V. serpyllifolia *L.* Temp. N. hemisp. Introduced.
V. Tournefortii *Gmelin.* Europe. Introduced.

SOLANACEAE.

Cestrum vespertinum *L.* West Indies. Introduced.
Solanum MacOwani *Fourc.* in Tr. R. Soc. S. Afr. 21, 10 (1932).

THYMELAEACEAE.

Gnidia hirsuta *M. Moss* ms.
G. psilotoides *Schinz* in Vierteljahrs. Nat. Ges. Zür. 46, 232 (1921).
G. struthioloides *M. Moss* ms.
Lachnaea glomerata *Fourc.* in Tr. R. Soc. S. Afr. 26, 101 (1932).
Struthiola Fourcadei *Compton* in Kew Bull. 1934, p. 261.
S. Pertheri *Sp. Moore* in Journ. Bot. 57, 112 (1919).
Passerina obtusifolia *Thoday* in Kew Bull. 1924, p. 157.
P. montana *Thoday* in Kew Bull. 1924, p. 152.
P. vulgaris *Thoday* in Kew Bull. 1924, p. 162.

UMBELLIFERAE.

Apium leptophyllum *F. v. Muell.* Tropics. Introduced.
Centella lanata *Compton* in Kew Bull. 1934, p. 259.

VERBENACEAE.

Bouchea integrifolia *Pearson* in Tr. S. Afr. Phil. Soc. 15, 179 (1905).

MONOCOTYLEDONES

AMARYLLIDACEAE.

Gethyllis unilateralis *L. Bol.* in Journ. Bot. May, 1929, p. 135..
Janthe flaccida *Nel* in Engl. Bot. Jahr. 51, 297 (1914).
J. trifurcillata *Nel* in Engl. Bot. Jahr. 51, 298 (1914).

CYPERACEAE.

Carex silvatica *Hudson.* Europe.
Tetraria compressa *Turrill & Schonl.* in Kew Bull. 1925, p. 72.
T. Fourcadei *Turrill & Schonl.* in Kew Bull. 1925, p. 72.
T. gracilis *Turrill* in Kew Bull, 1925, p. 73.

GRAMINEAE.

Aira capillaris *Host* Europe. Introduced.
Polypogon lutosus (Poir.) *Hitch.* Europe. Introduced.
Sporobolus Fourcadei *S. Stent* in Bothalia, 2, 269 (1927).
S. pectinatus *Hack.* in Oest. Bet. Zeitschr. 50, 3 198 (1932).

IRIDACEAE.

Acidanthera Fourcadei *L. Bol.* in Ann. Bol Herb. 4, 118 (1927).
A. roseo-alba *Lewis* in S. Afr. Gard. 23, 256 (1933)
Anapalina longituba *Fourc.* in Tr. R. Soc. S. Afr. 21, 76 (1932).
Antholyza Fourcadei *L. Bol.* in Ann. Bol. Herb. 4, 117 (1927).
Aristea cuspidata *Schinz* in Kew Bull. 1906, p. 25.
A. ensifolia *Muir* in Ann. Bol. Herb. 3, 139 (1922).
A. simplex *H. Weim.* in Monogr. of the Gen. Aristea 64 (1940).
Babiana fastigata *L. Bol.* in S. Afr. Gard. 17, 375 (1927).
B. Fourcadei *Lewis* in S. Afr. Gard. 24, 267 (1934).
Bobartia Keetii *Phillips* in Kew. Bull. 1920, p. 335.
B. orientalis *Gillett* in Journ. Bot. 68, 104 (1930).
B. rostrata *Gillett.*
Freesia Armstrongi *Watson* in Gard. Chron. 24, 195 (1898).
F. lactea *Fenzl ex Klatt* in Zeitschr. Schweiz. Gartenbauvereins, 1881, p. 37.
Geissorhiza inconspicua *Bak.* in Kew Bull. 1906, p. 26.
G. Patersoniae *L. Bol.* in Ann. Bol. Herb. i, 132 (1915).
G. violacea *Bak.* in Kew Bull. 1906, p. 26.
Gladiolus socium *L. Bol.* in Journ. Bot. 1931, p. 14.
G. Taubertianus *Schltr.* in Engl. Jahr 27, 103.
G. vaginatus *Bol. f.* in Ann. Bol. Herb. 2, 103 (1918).
Homeria Cookii *L. Bol.* in Fl. Pl. S. Afr. 8, t. 306 (1928).
H. lilacina *L. Bol.* in Ann. Bol. Herb. 3, 9 (1923).
Homoglossum Hollandii var. zitzikammense *L. Bol.* in S. Afr. Gard. 23, 46 (1933).
Romulea alpina *L. Bol.* in S. Afr. Gard. 18, 342 (1928).
R. longipes *Schltr.* in Journ. Bot. 1898, p. 377.
Tritonia chrysantha *Fourc.* in Tr. R. Soc. S. Afr. 21, 77 (1932).
T. lilacina *Bol. f.* in Ann. Bol. Herb. 3, 161 (1923).
Watsonia Beatricis *Matt. & L. Bol.* in Ann. Bol. Herb. 4, 52 (1926).
W. Desmidtii *L. Bol.* in Journ. Bot. 1933, p. 124.
W. Fourcadei *Matt. & L. Bol.* in Ann. Bol. Herb. 4, 26 (1926).
W. Galpinii *Matt. & L. Bol.* in Ann. Bol. Herb. 3, 11 (1923).
W. longifolia *Matt. & L. Bol.* in Ann. Bol. Herb. 4, 115 (1927).
W. Pillansii *L. Bol.* in Ann. Bol. Herb. 3, 75 (1921).
W. knysnana *L. Bol.* in S. Afr. Gard. 20, 63 (1930).
W. Priori *L. Bol.* in Ann. Bol. Herb. 4, 49 (1926).
W. Wilmaniae *Matt. & L. Bol.* in Ann. Bol. Herb. 4, 114 (1927).

LILIACEAE.

Aloe Muirii *Marl.* in S. Afr. Gard. 19, 210 (1929).
Albuca Schonlandi *Bak.* in Rec. Alb. Mus. i, 90.
Chlorophytum tuberculatum *A. Duthie* in Ann. Bol. Herb. 4, 137 (1928).
C. Fourcadei *Moss.* ms.
Gasteria Armstrongi *Schonl.* in Rec. Alb. Mus. 2, 258.

G. Beckeri *Schonl.* in Rec. Alb. Mus. 2, 140 (1907).
G. Thunbergii *N. E. Br.* in Bothalia, 1, 140 (1922).
Eriospermum cinctum *Marl.* ms.
E. cylindricum *Marl.* in S. Afr. Gard. 19, 327 (1929).
E. Dregei *Schonl.* in Tr. R. Soc. S. Afr. 1, 442 (1910).
E. molle *Marl.* ms.
E. nervosum *Marl.* ms.
Haworthia caespitosa *v. Poelln.* in Desert Pl. Life 9, 90 (1937).
H. Gordoniana *v. P.* in Fedde, Rep. 42, 269 (1937).
H. Haageana *v. P.* in Fedde, Rep. 28, 104 (1930).
H. Helmae *v. P.* in Fedde, Rep. 41, 201 (1937).
H. integra *v. P.* in Fedde, Rep. 31, 85 (1932).
H. Kingiana *v. P.* in Fedde, Rep. 41, 203 (1937).
H. Longiana *v. P.* in Fedde, Rep. 27, 132 (1937).
H. monticola *Fourc.* in Tr. R. Soc. S. Afr. i, 78 (1932).
H. Parksiana *v. P.* in Cactus Journ. 5, 34 (1936).
H. pygmaea *v. P.* in Fedde, Rep. 27, 132 (1929).
H. Schmidtiana *v. P.* in Fedde, Rep. 26, 23 (1929).
H. tuberculata *v. P.* in Fedde, Rep. 29, 219 (1931).
Massonia modesta *Fourc.* in Tr. R. Soc. S. Afr. 21, 79 (1932).
Neodregea Glassii *C. H. Wright* in Kew Bull. 1909, p. 308.
Lachenalia algoensis *Schonl.* in Tr. R. Soc. S. Afr. 1, 443 (1910).
L. haarlemensis *Fourc.* in Tr. R. Soc. S. Afr. 21, 79 (1932).
L. subspicata *Fourc.* in Tr. R. Soc. S. Afr. 21, 79 (1932).
Ornithogalum capillifolium *Fourc.* in Tr. R. Soc. S. Afr. 21, 80 (1932).
O. limosum *Fourc.* in Tr. R. Soc. S. Afr. 21, 80 (1932).
O. petraeum *Fourc.* in Tr. R. Soc. S. Afr. 21, 81 (1932).
O. subspicatum *Bak.* in Kew Bul., 1898, p. 164.
Polyxena ensifolia *Schonl.* in Tr. R. Soc. S. Afr. 1, 443 (1910).
Scilla violacea *Hutch.* in Kew Bull. 1932, p. 511.

Naiadaceae.

NAIADACEAE.
Naias marina *L.* Temperate and Tropical regions.

POTAMOGETONACEAE.

Althenia filiformis *Petit.* France.
Ruppia rostellata *Koch.* Europe. Trop. Asia.

RESTIONACEAE.

Hypolaena purpurea *Pillans* in Tr. R. Soc. S. Afr. 16, 393 (1928).
Restio Fourcadei *Pillans* in Tr. R. Soc. S. Afr. 16, 232 (1928).

ORCHIDACEAE.

Disa Newdigatae *L. Bol.* in Fl. Pl. S. Afr. sub. t. 415.
D. outeniquensis *Schltr.* in Ann. Transv. Mus. 10. 246 (1924).

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MEMOIR No. 21

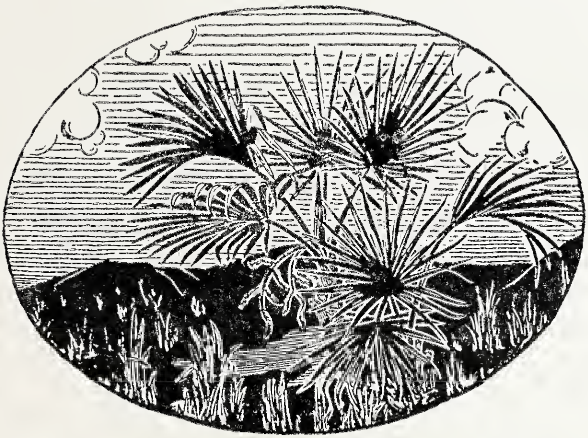
A Reconnaissance Trip through the Eastern Portion of the Bechuanaland Protectorate

APRIL, 1931

AND

An Expedition to Ngamiland

JUNE—JULY, 1937



by

I. B. POLE EVANS, C.M.G., D.Sc., M.A., LL.D.,
formerly Chief, Division of Plant Industry, and Director of Botanical Survey, Union of South Africa

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DIVISION OF PLANT INDUSTRY

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FOREWORD.

It is my honour to present for publication as Botanical Survey Memoir No. 21, two reports by Dr. I. B. Pole Evans—

A Reconnaissance Trip through the Eastern Portion of the Bechuanaland Protectorate, April, 1931;

and

An Expedition to Ngamiland, June–July, 1937.

An earlier expedition led by Dr. Pole Evans to Bechuanaland in 1929, which he mentions in his introduction, may be said to have heralded a grass conscious era in South African Agriculture. It was soon followed by great activity in establishing pasture research stations in various parts of the Union, where both the local veld and established indigenous grasses were tested.

Typed reports on the expeditions were completed by Dr. Pole Evans for official use soon after each trip. The reasons for the delay in their publication need not be detailed: suffice it to say that the last Botanical Survey Memoir appeared in 1941 and this is the first Memoir to appear since the end of the war of 1939–45.

The lapse in time makes it possible to look beyond the immediate results of the two botanical surveys. Omitting their purely scientific value, one can now assess more confidently their permanent practical value. On the basis of the satisfactory preliminary trials of grasses one can predict with confidence high dividends in pounds, shillings and pence.

Among the many outstanding grasses which Dr. Pole Evans collected and which seem destined to play a major part in pasture programmes and soil conservation, two can be singled out as having proved of exceptional potential value. These are a variety of *Panicum coloratum* collected at the Makarikari Pan in 1931 and now known widely as " Makarikari grass ", and a particularly leafy strain of *Setaria sphacelata* collected at Kazungula in 1937. Representatives of other genera, such as *Digitaria, Urochloa, Cenchrus* and *Brachiaria* may be more drought resistant, or provide better pasturage under certain conditions, but the above two grasses by their wide range of adaptability, should come into use over a larger area of South Africa. Their main economic value lies in their suitability to Highveld conditions where South Africa's granary is in the process of being ruined by monoculture and where marginal areas of lower fertility have already been abandoned as worn out.

The tendency in agriculture today is towards ley farming, which provides the soil with the much-needed rest from continual ploughing, but a prerequisite to ley farming is the possession of suitable grasses for rotation with crops. It is in this direction that the value of Makarikari grass and the Kazungula strain of *Setaria sphacelata* lies. Given adequate seed supplies—and both grasses set a reasonable amount of seed—there is every reason to hope that these grasses will play an important part in restoring and even enhancing the fertility of our Highveld soils.

Dr. Pole Evans has supplied valuable tools to this end, which agronomists should not fail to use in the best interests of our country.

R. A. DYER,

Chief, Division of Botany and Plant Pathology, and
Director of Botanical Survey for the Union of South Africa.

Pretoria, 1/12/1947.

A Reconnaissance Trip Through The Eastern Portion of the Bechuanaland Protectorate, April, 1931.

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ILLUSTRATIONS.

A RECONNAISSANCE TRIP THROUGH THE EASTERN PORTION OF THE BECHUANALAND PROTECTORATE.

INTRODUCTION.

From the time that the Bechuanaland Protectorate was first visited by Europeans in 1801 it has always been renowned for its fat cattle, sheep and goats. Even today some of the best slaughter cattle that reach the Johannesburg market during the months of September, October and November hail from the Protectorate, after they have trekked from their grazing camps to the rail-head, a distance of 150 miles or more, and then are trucked a distance of over 500 miles by rail.

Captain the Hon. B. E. H. Clifford, who made a reconnaissance of the Great Makarikari Lake during June and July, 1929, was much impressed by the fine grazing which he encountered en route and urged me, if possible, to visit this area. An opportunity of doing so occurred shortly afterwards when I was invited to accompany Mr. Herbert Lang on a preliminary trip to the Makarikari Lake on behalf of the Vernay-Lang Kalahari Expedition for the purpose of testing out the most suitable type of motor lorry for use on the expedition.

The trip was made during the latter part of December, 1929, and no sooner had we reached the north-east corner of the lake than heavy thunder storms were encountered which made motor transport in this area well nigh impossible, chiefly on account of the black turf and the total absence of any made roads. We therefore had to beat a very hasty retreat but not before I had gained an insight into the pasture resources of those parts and had made a small collection of living grasses which had been closely grazed along our route.

Some of these grasses gave such promising results after they were established at our pasture research station at Pretoria that I felt that this region would well repay further investigation. I therefore represented the matter to Major Walter Elliot who had recently visited South Africa and who had seen some of the pasture research work at Pretoria. Major Elliot promptly put the matter before the Empire Marketing Board which generously granted me a sum of £100 towards a survey of the pasture grasses of the Protectorate, subject to the approval of my Minister, General the Hon. J. C. Kemp.

Not only did General Kemp grant me permission to undertake the work, but he also allowed me to take two members of my staff as assistants, and further granted me permission to take and use two Union Government motor lorries for the expedition, provided all the expenses of the staff and the cost of petrol, etc. were defrayed from the Empire Marketing Board's Grant. Before visiting the Protectorate I was requested by the Imperial Secretary to communicate with the Resident Commissioner regarding my proposed visit. I therefore suggested to the Resident Commissioner that I would particularly like to see those parts of the Bechuanaland Protectorate which were known to produce the best cattle, and, as a result, Mr. W. H. Chase, Chief Veterinary Officer, Bechuanaland Protectorate Government, was deputed to draw up an itinerary for me, which he very kindly did.

The route proposed was from Mafeking to Ramathlabama through the Baralong Farms, the Lobatsi Block, to Lobatsi and Gaberones and from thence along the Marico river, through the Tuli Block as far north as Selika Camp, and then to Palapye Road, from there through the Quarantine Camp and Bamangwato Reserve to Francistown, and thence through the Tati Concession to the Great Makarikari Lake and the Nata grazing grounds.

I left Pretoria on the 9th April, 1931, with a Dodge $1\frac{1}{2}$ ton motor caravan and a Chevrolet $1\frac{1}{2}$ ton motor lorry, and took with me as assistants Mr. A. C. Douthwaite of the General Garage, Pretoria, who had had considerable experience of motor transport in the Kalahari, Mr. J. A. Pentz, Officer in Charge of the Pretoria Pasture Research Stations, Mr. J. C. Howlett, assistant in the National Herbarium, Pretoria, and two natives.

We arrived at Mafeking, where Mr. Chase the Chief Veterinary Officer of the Bechuanaland Protectorate Government was to join us, at 10 a.m. on April 10th. After I had called on the various Bechuanaland Protectorate Government officials in Mafeking Mr. Chase informed me that he regretted very much that he would not be able to accompany me, owing to a recent outbreak of Foot and Mouth disease in Southern Rhodesia, which would require his services in connection with the guarding and closing of their adjoining borders. While we were in Mafeking heavy rain fell and this continued for nearly a week afterwards. We left Mafeking early the same afternoon in pouring rain and Mr. Chase accompanied us as far as the Bechuanaland Protectorate border where he had a small Experiment Station at Ramathlabama, a distance of some fifteen miles away.

Before we reached Ramathlabama the roads had become very sodden and travelling was difficult in several places. As the weather showed no signs of improving, and the rain appeared to be general over the whole country, Mr. Chase advised me to curtail his original itinerary so as to avoid parts of the country where motor transport was wellnigh impossible after heavy rains. Therefore, instead of proceeding from Gaberones north-eastwards to Sequani and travelling from thence along the Marico river to Palla Camp at the junction of the Marico and Notwani rivers, we were compelled to follow a route from Gaberones to Debeeti, which ran close to the main railway line. From Debeeti we visited the southern end of the Tuli Block but were not able to proceed through this northwards further than the junction of the Mahalapye river with the Limpopo owing to the bad state of the roads. As it was we encountered considerable difficulty in travelling on the main road between Palapye Road and Francistown, and much time was wasted in repairing numerous drifts, corduroying stretches of black turf, and extricating our motors en route.

Nearly a day was spent negotiating the Shashi drift, in spite of the fact that twelve oxen were waiting to assist us there, on instructions from the Resident Commissioner. Six more oxen had to be procured before our motors could be pulled over the steep northern bank, and this was not accomplished until both lorries had been unloaded of all their baggage and equipment. This difficulty in crossing the Shashi was however not the fault of the heavy rains, as the river had not yet come down, but was due to the utterly bad drift, especially at the northern bank, where not only was the approach to the bank bad, but the bank itself was far too steep.

After this we reached Francistown on April 17th without any further difficulties, and from now on the weather cleared up, and travelling, collecting, and photography could be carried on with comparative ease. Our troubles, however, were not altogether over—just 70 miles before we reached the Great

Makarikari Lake my Dodge caravan struck a hidden stump in the grass and sustained a badly bent front axle. As there was no means of replacing or straightening it en route we were compelled to carry on as best we could under the circumstances, and to add still further to our troubles each motor broke a main back spring, which fortunately our mechanic was able to fix up temporarily from time to time.

From the northern portion of the Protectorate we returned via Southern Rhodesia, through Plumtree, Bulawayo and West Nicholson to Messina in the Transvaal and from thence to Pretoria, where we arrived on April 29th.

Owing to the rapid spread of Foot and Mouth disease in Southern Rhodesia and to telegraphic warnings which I received from Pretoria about the inadvisability of bringing in plants from Southern Rhodesia, all plant-collecting was abandoned in that territory, and on arrival at Beit Bridge all our collections had to undergo a process of disinfection which fortunately most of our living plants have survived.

In all I spent just 13 days in the Protectorate, and the week's rain which we encountered over the first half of the trip, combined with the resulting bad state of the roads, not only detracted much from the pleasure to be derived from a tour under more auspicious conditions but it rendered photography difficult and on many occasions impossible. Thus several types of vegetation, and many interesting vegetative features which were encountered, are not represented in the collection of photographs accompanying this report. Further, collection of herbarium material and pasture grasses for analysis under these circumstances was not conducive to the best results, but fortunately, with regard to the latter, by hanging them in linen bags from the roof of my caravan, then stringing them out to dry on every suitable occasion, every sample collected was brought back to Pretoria in first class condition.

On returning to Pretoria it was found that the two motor lorries between them had covered a total distance of 3,654 miles.

GENERAL DESCRIPTION OF THE BECHUANALAND PROTECTORATE.

The Bechuanaland Protectorate occupies the heart of Southern Africa. It is enclosed on the west by South West Africa, on the south by the Cape of Good Hope, on the east by the Transvaal and Southern Rhodesia, and on the north by Northern Rhodesia and Angola.

It occupies about 275,000 square miles of country whose mean average altitude is some 3,300 feet above sea level. A very large portion of this area is known as the Kalahari desert although the country is anything but a desert in the true sense of the word. It is covered throughout, except along its eastern boundary, by a more or less deep mantle of sand which, combined with a comparatively low rainfall, gives rise to vast waterless expanses of country. For the most part the country is flat and featureless, but after heavy rains surface water occurs, chiefly in the form of pans, which soon dry up with the departure of the rainy season.

The land is covered with a more or less dense covering of grass, bush and trees, depending entirely on the depth of soil and its water supply available for plant growth. On the present tour only the eastern edge of the Protectorate came under review. The route actually followed was : Mafeking to Ramathlabama, through the eastern edge of the Baralong farms to Pitsani, through the Lobatsi Block to Lobatsi, Ramoutsa and Gaberones, through the Bakhatla Reserve following the road parallel with the railway line as far as Debeeti,

thence eastwards to the southern end of the Tuli Block at Palla Ranch, through the Tuli Block as far as Sass's Post and then along the back line fence of the Tuli Block as far as the Mahalapye river, up the valley of the river as far as Mahalapye and from thence along the road running practically parallel with the railway line to Palapye Road, Francistown, and Tsessebe. From Tsessebe we proceeded in a northwesterly direction through the Tati Concessions to Kalakamati, Tutumi and Bushman Mine, to the north-east arm of the Great Makarikari Lake. From here we travelled some little distance up the Nata river and then to N'Kate. From N'Kate we struck north-eastwards to Sebonini on the Southern Rhodesian border and then visited the Nata grazing grounds near the junction of the Nata and Maitengwe rivers, and then entered Southern Rhodesia near Plumtree by traversing the Hunters Road. The route thus traversed the following well defined districts of the Protectorate :—

1. The Baralong Farms.
2. The Lobatsi Block.
3. The Bamalete Reserve.
4. The Gaberones Block.
5. The Bakhatla Reserve.
6. The Tuli Block.
7. The Bamangwato Reserve.
8. The Tati Concession.

In addition a small portion of—

9. The Great Makarikari Lake.
10. The country north and north-east of the Nata.
11. The country at the junction of the Nata and Maitengwe rivers was examined.

In describing the vegetation encountered on the trip I shall deal with it in this order and under these artificial boundaries, instead of under its natural limits, as might more appropriately have been done, simply because I think if treated in this way the report may possibly be of more interest and more general value to the local Government Administration.

THE DISTRICTS VISITED.

(1) The Barolong Farms.

(*Figures* 1 *to* 3).

These occupy a comparatively small oblong block of country situated in the extreme south-east corner of the Protectorate. They are in extent approximately 450 square miles. On the south they are bounded by the Ramathlabama Spruit, on the east by the Transvaal border. They were traversed for a distance of some fifteen miles on the main road from Ramathlabama to Lobatsi. They are situated on the high plateau country which forms the watershed between the Molopo and Notwani rivers and which lies at an altitude of over 4,000 feet above sea level. The southern portion of this area is covered by older granite and gneiss, while the northern portion is composed of beds of the Ventersdorp series. The soils overlying these formations are of a distinctly sandy nature. The average annual rainfall varies from 20–25 inches. The vegetation covering this area is typical parkland, of open woodland character. The dominant tree is the Camel Thorn *Acacia giraffae* ; other common trees were the Sweet Thorn,

Acacia karroo, the Wag-'n-bietjie *Zizyphus mucronata*, and the Karree *Rhus viminalis*. Associated with these were the following bushes: The Vaalbos *Tarchonanthus camphoratus*, the terassi-bos *Acacia hebeclada*, the haakdoring *Acacia detinens*, the Rosyntjie-bos *Grewia cana*, the elandsboontjie, *Elephantorrhiza elephantina*, the kriedoring *Lycium arenicolum* and the guarri *Euclea undulata*.

The grass covering over this area was good. The dominant grass was *Eragrostis Lehmanniana*, while there was much *Digitaria stolonifera*. Other good pasture grasses noted were *Panicum coloratum*, *Brachiaria nigropedata*, *Anthephora pubescens*, *Schmidtia bulbosa*, and *Themeda triandra*. *Cymbopogon excavatus* and *C. plurinodis* were not infrequent. The veld throughout this area was in good condition and plenty of spare grazing was still available.

---

(2) The Lobatsi Block.

(*Figure* 4.)

This consists of a narrow rectangular strip of country some 30 miles long by roughly nine miles wide lying north of the Baralong Farms and bisected longitudinally into two equal portions by the railway line. It is approximately 118,000 acres in extent.

In the southern portion the geological formation belongs to the Ventersdorp system, while towards the north considerable variation occurs, and the country becomes much broken and hilly, due to the outcrop of rocks belonging to the Waterberg and Transvaal systems.

As soon as the farm "Hilda Vale" is reached a distinct change in the vegetation is noticed. Open park country changes to thorn country and low trees or bush are the chief features in the landscape.

On the hills *Vitex Zeyheri*, *Zizyphus mucronata* and *Rhus lancea* dominated, while *Aloe Marlothii* was also conspicuous. On the flat country between the hills *Euclea lanceolata* was dominant, and the rest of the bush was composed of *Acacia litakunensis*, *Acacia dulcis*, *Acacia karroo*, *Acacia detinens*, *Acacia Benthami*,* *Peltophorum africanum*, *Royena pallens* and *Tarchonanthus camphoratus*.

The dominant grass throughout this part was *Eragrostis Lehmanniana*, while the thorn bushes usually sheltered and harboured much *Digitaria*. *Eragrostis gummiflua* was also very prevalent.

North of Lobatsi more open park country was encountered and large trees of *Acacia litakunensis*, *Acacia Benthami*, *Acacia eriadenia*, *Acacia caffra*, *Rhus lancea*, *Peltophorum africanum*, *Combretum Zeyheri* and *Combretum hereroense* occurred in an almost pure *Eragrostis Lehmanniana* sward.

Opposite Bathoen Station fairly dense thorn bush of *Zizyphus mucronata* and *Acacia litakunensis* occurred with *Tarchonanthus camphoratus*.

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(3) The Bamalete Reserve.

(*Figure* 5.)

This is another small rectangular block of country just north of the Lobatsi Block, and like it is also bisected longitudinally by the railway line. Its extent is approximately 178 square miles. It and the Lobatsi Block are both drained by the upper reaches of the Notwani river. The vegetation seen was typical thorn country.

---

* A. Benthami Rochbr. = A. arabica var. kraussiana Benth.

The country is somewhat broken by irregular kopjes and hills. On the flats between the hills fairly thick thorn bush occurs. Thickets of *Acacia litakunensis* dominate throughout, especially on the waterlogged soils, with *Acacia detinens* and *Spirostachys africanus* dominant. On the stony hillslopes and outcrops *Pappea fulva, Peltophorum africanum* and *Combretum hereroense* were common.

The dominant grass was *Eragrostis Lehmanniana* with much *Digitaria* and *Panicum coloratum.*

This reserve was closely grazed throughout, especially in the neighbourhood of Ramoutsa's Stad.

---

(4) The Gaberones Block.

This is a triangular piece of country approximately some 99,000 acres in extent, situated also in the valley of the Notwani river. The geological formation is mainly granite and gneiss, and the soil is sandy with patches of black turf. The vegetation was typical thorn country, but changing to parkland on the drier soils.

The trees and bush on the sandy soils were *Burkea africana, Terminalia sericea, Combretum Zeyheri, C. hereroense, Peltophorum africanum, Sclerocarya caffra, Rhus lancea, Acacia giraffae, A. detinens, A. litakunensis, Combretum porphyrolepis, Euclea lanceolata, Vitex Zeyheri, Grewia flava* and *Grewia cana.* On the black turf and waterlogged soils *Acacia litakunensis, Boscia Rehmanniana* and *Spirostachys africanus* usually dominated.

Eragrostis Lehmanniana was the dominating grass, and a good deal of creeping finger grass (*Digitaria sp.*) was associated with it.

---

(5) The Bakhatla Reserve.

(*Figures* 6 *to* 14.)

This is an irregular block of country bounded on the east by the Marico river, and on the west by an artificial line drawn nearly parallel with longitude 26°. It is approximately 3,600 square miles in extent. The southern portion lies at about 3,300 feet above sea level while towards the north the greater part of the country is about 3,000 feet above sea level. In the south granite and Waterberg sandstone occur, but the northern portion is largely covered by Kalahari sand. The country is flat and undulating, with a few isolated hills near Pilane and Mochudi. Only the western portion was seen. It was entered at a point about ten miles south of Metsimaclaba Station and then it was traversed by a road that runs close to the railway line through the northern border.

The southern portion, which embraced the valley of the Notwani river, was covered with dense thorn bush composed mainly of *Acacia litakunensis, A. detinens, A. dulcis, A. giraffae, A. karroo, Boscia albitrunca* and *Boscia Rehmanniana. Eragrostis Lehmanniana* was the dominant grass on the sandy soils, but on the black turf and clay soils *Panicum maximum* and *Panicum coloratum* were the dominating species. *Digitaria* was also very plentiful throughout this thorn country.

On the Kalahari sand to the north the bush was more open and was made up of *Acacia giraffae, Terminalia sericea, Combretum hereroense, Peltophorum africanum, Burkea africana, Acacia detinens, A. dulcis, Ochna pulchra, Commiphora pyracanthoides* and *Bauhinia macrantha.*

The grass flora on the Kalahari sand was both distinctive and characteristic. It was composed mainly of *Eragrostis pallens, Aristida uniplumis, Megaloprotachne albescens, Panicum kalaharense, Triraphis andropogonoides, Schmidtia bulbosa, Anthephora pubescens, Digitaria Polevansii, Panicum coloratum, Urochloa pullulans,* and *Pogonarthria falcata.* Some splendid ranching country was seen in this northern section.

---

(6) The Tuli Block.

(*Figures* 15 *to* 17.)

This is a narrow strip of country about 10 miles wide and 200 miles long on the western bank of the Limpopo. It comprises some 1,205,000 acres and stretches from the northern boundary of the Bakhatla Reserve northwards as far as the junction of the Shashi river. Owing to the impassable state of the roads only a very small portion of the southern end of the block was seen. It was only actually traversed for a distance of 24 miles, namely: From Palla Ranch to Sass's Post, where Mr. H. C. Weatherilt, O.B.E., J.P., and the Hon. John Stuart were visited. The vegetation of the southern portion of the Tuli Block is typical thorn country in which *Acacias* dominate.

Dense thickets of *Acacia litakunensis* and *Acacia detinens* occur just beyond the river bank. Behind this the bush is more open and is composed of trees of *Acacia pallens, A. giraffae, Acacia albida,* and *Acacia dulcis,* associated with *Grewia spp., Boscia albitrunca, Commiphora pyracanthoides* and *Lycium.*

On Palla Ranch some magnificent pasturage composed of *Digitaria Polevansii, Anthephora pubescens, Urochloa pullulans, Cenchrus ciliaris, Chloris virgata, Eragrostis Lehmanniana* and *Panicum maximum* was seen, and it was evident that considerable care and attention must have been devoted to pasture management on this ranch whereby overstocking and overgrazing had been avoided. On the adjoining farms a very different picture was presented. Most of the valuable grasses were absent, and their place was taken by *Aristidas* and *Enneapogons*, and a lot of weeds such as *Tribulus terrestris.*

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(7) The Bamangwato Reserve.

(*Figures* 18 *to* 32.)

The Bamangwato Reserve is a large, roughly rectangular block of country situated in the centre of the eastern portion of the Protectorate. On the east it is bounded by the Tuli Block, on the north by the Shashi river, Hunters road, and Maitengwe river, on the north-west by the Nata river, the east and southern shores of the Great Makarikari Lake and the Botletle river, while its western boundaries are demarcated by artificial lines drawn through longitudes 24°–26° and latitudes 21°–24°. The reserve is estimated to occupy approximately 39,000 square miles.

The country seen was for the most part flat and featureless. Along its eastern border, where it falls within the valley of the Limpopo, its average height above sea level varies from 2,000 to 3,000 feet, whereas the remainder lies at an average height of 3,000 to 4,000 feet above sea level. Over the eastern portion there are considerable outcrops of granite and gneiss, while rocks of the karroo and Waterberg systems also occur to a limited extent. Over the rest of the country there are deep deposits of Kalahari sand.

This reserve was traversed from a point where the main line crosses its southern boundary to as far as Debeeti, and from here a north-easterly course was followed to the Tuli Block at Palla Ranch. Its south-eastern boundary was then skirted along the back line fence of the Tuli Block northwards to the Mahalapye River. From here the valley of the Mahalapye was passed through to Mahalapye, whence the route following the railway line to Shashi was taken. The north-eastern portion was visited by following Clifford's route from Kalakamati to Bushman Mine from whence the north-eastern arm of the Great Makarikari Lake was crossed and a course from thence was pursued northwestwards to the Nata river. The north eastern boundary was touched by following the Hunters Road from the point where it crosses the Maitengwe river to Takaya store.

Two well marked types of vegetation were encountered on the above route. South of the valley of the Lotsani the country is mostly open parkland in which *Acacias* dominate. Towards the west, however, wherever the Kalahari sand encroaches, the vegetation becomes still more open and gives way to desert grassland with scattered bush and isolated trees. Here and there, wherever water tends to accumulate and the soils become waterlogged, thickets of *Spirostachys africana* may be found.

From the Lotsani Valley northwards the great tropical African mopane (*Copaifera mopane*) belt was entered and mopane dominated the vegetation throughout. Sometimes it occurred as low bush or scrub in a pure association, at other times it was sparsely mixed with *Acacia* or other bush; frequently it was found in close thickets or coppices or again, especially in the north, as high forest.

The bush on the Kalahari sand in the southern portion of the Bamangwato reserve in the neighbourhood of Debeeti was composed of *Acacia giraffae, A. detinens, A. dulcis, Terminalia sericea, Grewia cana, Grewia spp., Tarchonanthus camphoratus* and *Combretum imberbe.* On deeper sand the bush was frequently replaced by tree growth composed of large trees of *Terminalia sericea, Burkea africana, Ochna pulchra, Strychnos pungens* and *Combretum imberbe* while fine specimens of *Spirostachys africanus* frequented waterlogged sites.

The grass flora of the Kalahari sand in this area was most characteristic. It consisted mainly of *Eragrostis pallens, Aristida uniplumis, Megaloprotachne albescens, Panicum kalaharense, Eragrostis superba, Anthephora pubescens, Schmidtia bulbosa, Triraphis andropogonoides, Digitaria glauca* var. *Bechuanica. Digitaria Polevansii,* and *Pogonarthria falcata.* Of common occurrence in this grass cover were large patches of the plant *Marlothia spartioides.*

Lying between Debeeti and the valley of the Limpopo on Waterberg sandstone formation was a high-lying stretch of country covered by fairly dense thorn bush. This was found to be composed of *Acacia litakunensis, Acacia dulcis, Dichrostachys nutans, Peltophorum africanum, Dombeya densiflora, Grewia cana, Grewia caffra, Commiphora pyracanthoides, Combretum hereroense, Terminalia sericea, Boscia Rehmanniana, Boscia albitrunca, Euclea lanceolata, Sclerocarya caffra, Burkea africana, Securidaca longipedunculata, Cadaba juncea and Lycium arenicolum.* The common grasses throughout this bush were *Panicum coloratum, P. maximum, Eragrostis superba, Eragrostis* sp. near *angusta, Enneapogon scoparius* and *Digitaria Polevansii.*

The south-eastern border of the Bamangwato reserve falls within a large portion of the great open lowlying valley of the Limpopo where its average height above sea level is between 2,000 and 3,000 feet. Directly this was reached

another marked change in the vegetation was noted. It was of the open woodland type in which tall trees of *Acacia pallens* dominated. Bordering the Tuli Block gigantic trees of this species were often so closely grouped together that they formed magnificent open forests. Closely associated with them were frequently large trees of *Combretum porphyrolepis*, and a fairly close undergrowth of *Grewia cana*. From this point northwards throughout the Bamangwato reserve *Acacia pallens* occurred. Other common trees in this parkland country adjoining the Tuli Block were *Acacia litakunensis*, *Acacia detinens* and *A. dulcis*. Sometimes they formed dense thickets, at other times they occurred in sparse formation. This type of thorn country extended through the Mahalapye valley to Mahalapye and from thence as far as the Lotsani Valley.

The grasses noted throughout this *Acacia pallens* parkland were *Digitaria Polevansii*, *Urochloa pullulans*, *Cenchrus ciliaris*, *Panicum maximum*, *Panicum coloratum*, and much *Aristida* spp.

On the high-lying and dry granite country between Mahalapye and Towani large trees of *Combretum apiculatum*, *Terminalia sericea*, *Peltophorum africanum*, *Sclerocarya caffra*, *Albizzia Harveyi*, *Kirkia acuminata*, and *Commiphora Welwitschii* formed a conspicuous feature of the *Acacia pallens* parkland, while the common grasses here were : *Heteropogon contortus*, *Brachiaria nigropedata*, *B. regularis*, *Digitaria* sp. near *eriantha*, *Urochloa bolbodes*, *Eragrostis* sp. near *angustata*, *Schmidtia bulbosa*, *Pogonarthria falcata*, *Chloris virgata*, *Aristida* sp. near *angustata*, *A. graciliflora*, *A. barbicollis* and *A. adscensionis*.

Just before reaching Towani a distinct change in the character of the soil took place, and both bush and grass were distinctly denser in their covering. The geological formation had now changed from granite to that known as Sediments of the Northern region of the Karroo system. The soil was a hard, dark red loam. The bush was composed mainly of *Acacia litakunensis*, *A. detinens*, *A. dulcis*, *Dichrostachys nutans* and *Zizyphus mucronata*, while the dense grass covering was made up of *Themeda triandra*, *Heteropogon contortus*, *Cymbopogon* sp., *Panicum* spp., *Brachiaria serrata*, *Eragrostis* sp. near *augusta* and much *Digitaria* sp.

It was on this type of veld that the southern portion of the Bechuanaland Protectorate Government's quarantine camp at Towani was situated. This type of country extended northwards from Towani for a distance of about six miles, and open woodland vegetation composed of large trees of *Combretum apiculatum*, *Burkea africana* and *Kirkia acuminata* occurred, with frequently dense thickets of large *Spirostachys africanus* and stretches of *Copaifera mopane*. Apart from a small stretch of country around Palapye Road, where the vegetation was typical of that previously noted on Kalahari sand, the mopane from now onwards became the dominant feature in the vegetation. Sometimes it occurred in dense formation over wide stretches almost to the exclusion of all other trees, at other times it grew more sparsely in open park country associated with *Acacia pallens*, *Sclerocarya caffra*, and *Lonchocarpus capassa*. Generally speaking the grass covering throughout this mopane country from Palapye Road to the Shashi river was poor, the dominant grass being a tall *Eragrostis*.

Much the same condition of affairs existed in the north-eastern corner of the Bamangwato reserve ; high mopane forest dominated throughout, but wherever the soils were shallow or well drained the mopane was replaced by large trees of *Acacia pallens*, *Kirkia acuminata* and *Sclerocarya caffra*. Dense thickets of *Commiphora Fischeri* were also a feature of these parts, while *Dalbergia melanoxylon* was plentiful on the black turf soils.

The grass covering on the shallow soils was scanty and consisted mainly of species of *Eragrostis* and *Aristida*, whereas the deep black turf soils were covered with a luxuriant growth of a tall *Setaria*, probably a new species.

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(8) The Tati Concession.

(*Figures* 33 *to* 47.)

This is an elliptical block of country some 2,700 square miles in extent lying on the eastern border of the Protectorate. On the south and west it is bounded by the Shashi river, on the east by the Ramaquabane river from its source to its junction with the Shashi, and on the north it is delimited by the watershed of these rivers and those flowing north into Southern Rhodesia.

The country rises from 2,500 feet above sea level in the south to 4,500 feet in the northern portion. The geological formation is mainly granite and gneiss, while the soils for the most part are sandy loams with stretches of black turf. The country was inspected from the main road which runs from Shashi drift via Francistown to Tsessebe station and follows closely the railway line throughout this distance. A short detour to the west was made from Tsamaea siding for the purpose of visiting Tantabane. From Tsessebe the northern portion of the territory was crossed by taking the road to Kalakamati.

The general vegetation seen was typical parkland consisting of a great variety of trees and a good grass covering.

After crossing the Shashi a belt of thorn country some two miles in extent was passed through. The trees were mainly *Acacia pallens*, *A. litakunensis* and *A. dulcis*, and there was a luxuriant undergrowth of grasses such as *Panicum maximum*, *Digitaria* spp. and *Urochloa* spp. After this a fairly dense type of parkland country extended as far as Francistown. Compared with the vegetation seen further south, this park country was remarkable not only for the great variety of trees which composed it, but also for the broad-leaved grasses which carpeted the ground. The trees were so mixed that it was impossible to say that any one species dominated the others. They included *Copaifera mopane*, *Acacia pallens*, *A. dulcis*, *Combretum porphyrolepis*, *C. suluense*, *Lonchocarpus capassa*, *Peltophorum africanum*, *Terminalia sericea*, *T. prunoides*, *Bolusanthus speciosus*, *Boscia albitrunca*, *Balsamodendron africanum*, *Rhus lancea*, *Commiphora Fischeri*, *Kirkia acuminata* and *Sclerocarya caffra*, while *Grewia pilosa*, *G. caffra*, *Commiphora pyracanthoides*, *Rhigozum brevispinosum*, *Cataphractes Alexandri* and *Ximenia americana* occurred amongst them as bushes.

The grasses were composed mainly of *Urochloa pullulans*, *Digitaria stolonifera*, *D. valida*, *Panicum maximum*, *Schmidtia bulbosa*, *Cenchrus ciliaris* and *Eragrostis* sp. near *angusta*. Of these the *Urochloa* and *Digitaria* spp. were often dominant over considerable stretches and especially the former.

North of Francistown a wide stretch of black turf was encountered. On this *Copaifera mopane* dominated while the grasses covering it were an undescribed species of *Setaria*, and *Dichanthium annulatum*.

On better drained soils between Bosoli and Tsamaea large trees of *Kirkia acuminata*, *Sclerocarya caffra*, *Burkea africana*, *Terminalia sericea*, *Lonchocarpus capassa* and *Albizzia Harveyi* were conspicuous above thickets of *Commiphora Fischeri*.

From Tsamaea siding Mr. Gordon, the Resident Manager of the Tati Concession very kindly conducted me to the farm Tantabane some four miles west of the railway line, where I was given a chanee of seeing some magnificent furniture being made from local timbers and the opportunity was also taken of examining the vegetation surrounding a large granite outcrop close at hand. The trees surrounding it included : *Pterocarpus angolensis, P. sericeus, Albizzia Harveyi, Burkea africana, Kirkia acuminata, Ptaeroxylon obliquum, Ochna pulchra, Bolusanthus speciosus, Combretum suluense, Sterculia tomentosa, Lannea discolor* and *Commiphora Fischeri*, most of which are valuable and useful trees.

Just north of Tsamaea siding some magnificent grazing veld composed of *Chrysopogon serrulatus, Digitaria eriantha* and *D. milanjiana* occurred and this extended as far as Tsesebe. From Tsessebe westwards to Kalakamati some of the best pastoral eountry seen in the Protectorate was passed through. It consisted of a series of open river valleys, ineluding the Inchwe, Tati, and Vukwe, of parkland vegetation carrying many valuable trees, and clothed with a rich carpet of luscious grasses.

In the Inchwe valley *Terminalia sericea, Peltophorum africanum, Combretum suluense, Burkea africana, Dombeya densiflora, Kirkia acuminata, Copaifera mopane, Lannea discolor, Strychnos pungens, Diplorrhynchus mossambicensis, Dalbergia melanoxylon, Thespesia populnea* and *Entandophragma caudata* were noted, while the grasses observed were *Digitaria eriantha, D. milanjiana, Chrysopogon serrulatus, Dactyloctenium aegyptium, Brachiaria nigropedata, Pogonarthria falcata, Heteropogon contortus, Schmidtia bulbosa* and *Chloridion Cameronii.*

In the Tati Valley the trees were *Acacia pallens, A. karroo, A. seyal, A. Rehmanniana, Albizzia Harveyi, Bolusanthus speciosus, Selerocarya caffra, Combretum porphyrolepis, Peltophorum africanum* and *Rhus lancea.* The grasses included *Panicum maximum, Urochloa pullulans, U. bolbodes, Amphilophis insculpta, Echinochloa colona, Heteropogon contortus* and *Hyparrhenia hirta.*

The Vukwe Valley contained much *Acacia* country, which ineluded *Acacia pallens, A. Galpinii, A. litakunensis, Dichrostachys nutans, Peltophorum africanum, Zizyphus mucronata, Pterocarpus sericeus, Combretum porphyrolepis, Copaifera mopane, Albizzia Harveyi* and *Bolusanthus speciosus.* Grasses noted here were : *Panicum maximum, Eragrostis Lehmanniana, Digitaria eriantha, D. milanjiana, Panicum eoloratum, Schmidtia bulbosa, Urochloa bolbodes* and *Cenchrus ciliaris.*

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(9) The Great Makarikari Lake.

(*Figures* 48 *to* 50.)

The only portion examined was a section across the north-eastern arm for a distance of about ten miles. High mopane forest extended almost to the southern shore. Associated with the mopane on the shore were *Salvadora persica, Hyphaene crinita* and *Terminialia Randii.* The dominant grass just above high water mark was *Sporobolus pungens,* which makes a dense covering over wide areas.

On a narrow tongue of rising ground across the arm of the lake there were thickets of *Acacia detinens* and seattered plants of *Aloe rubrolutea* and *Gossypium transvaalense.*

Other grasses in the vicinity were *Cenchrus ciliaris, Sporobolus bechuanicus, Digitaria milanjiana, Panicum meyerianum, Panicum minus* var. *planifolius, Aristida gracilior* and *Dactyloctenium aegyptium.* On the damp brackish mud flats *Suaeda fruticosa* flourished.

(10) North of the Nata.

(*Figures* 51 *to* 68.)

The Nata river was crossed about five miles above its confluence with the lake. At this point the banks were lined with large trees of *Copaifera mopane*, *Acacia pallens*, *Albizzia Harveyi* and *Lonchocarpus capassa*. Directly the river was crossed heavy white sand was encountered, and just back from the river it was covered by low bush consisting of *Grewia flava*, *Dalbergia melanoxylon*, *Commiphora pyracanthoides*, *Rhigozum brevispinosum*, *Ximenia americana* and *Dichrostachys nutans*, while the grasses were mainly *Eragrostis pallens*, *Aristida uniplumis* and *Panicum kalaharense*.

Proceeding northwards a vast grassy plain was encountered in which low bush or trees consisting of *Terminalia sericea*, *Combretum apiculatum*, *Lonchocarpus laxiflorus*, *Acacia giraffae* and *Grewia cana* occurred singly in the grass sward which was made up largely of *Aristida* spp. *Eragrostis pallens*, *Anthephora pubescens*, *Triraphis andropogonoides*, *Schmidtia bulbosa* and *Digitaria valida*. This type of country continued for about seven miles as far as N'Kate. From here a detour was made in a south-westerly direction for a distance of eleven miles where some magnificent open parkland country was found, and in which vast herds of eland, gemsbok and Hartebeest were grazing, and which, by the way, were entirely unmolested by my party. These animals were grazing mainly on great stretches of practically pure stands of a tall finger grass (*Digitaria valida*) the like of which I had never seen before. Some gigantic trees of *Acacia Galpini*, *Sclerocarya caffra*, *Acacia giraffae*, and *Terminalia sericea* added to the general grandeur of this parkland.

On returning to N'Kate a north-easterly course was struck for Sebonini in order to visit the Nata grazing grounds. Immediately on leaving N'Kate very heavy white sand was met with on which were dense thickets of low bush of *Terminalia sericea*, *Acacia giraffae*, and *Grewia cana*. This continued for a distance of about three miles.

After this we emerged on to a vast grassy plain which extended for some four miles, and in which there occurred at frequent intervals large patches of *Chrysopogon*, still in a very fresh green condition. The dominant grasses on this plain were *Eragrostis pallens* and *Aristida uniplumis*. From here a great apparently dead flat plain of orchard country was crossed for some eight miles. It consisted of a great palm stand or belt in which tall *Hyphaenes* were scattered singly or in groups in tall coarse grass some six feet high composed mainly of *Hyparrhenia ruprechtii*, *Aristida meridionalis*, *Elyonurus argenteus* and *Aristida Pilgeri*. Occasionally large isolated trees of *Combretum porphyrolepis*, *Sclerocarya caffra* and *Terminalia* were associated with the palms.

Towards the eastern edge of this palm belt large solitary baobabs loomed on the horizon, and with their advent the palms ceased, and low mopane bush just a couple of feet high invaded the grass which was now much shorter and of an entirely different composition, being made up mainly of *Aristida* spp., *Cenchrus ciliaris* and *Heteropogon contortus*. Still further east the mopane bush steadily increased in abundance and height and very soon the whole country was covered with mopane forest. At the edges of these forests large groups or small forests of *Ricinodendron Rautanenii* were encountered for the first time, and from the great branches which had been broken, and the dung, and the trampling of elephants below them, it was clear that these forests were the favourite haunts of these animals.

From this point we struck a course southwards and after travelling some ten miles through mopane forest came to a large water hole known as Sepako Lake where we were told the elephants regularly drank. It was clear that this lake was merely a portion of a large dry river bed. We were told that it was the Sebonini river and that its junction with the Nata was close by. The dry river bed was covered with a dense growth of a luscious light blue leaved *Panicum* which had been closely cropped by cattle and game. The banks of the river were lined at this spot by large trees of *Gardenia Thunbergiana*, *Acacia kirkii*, *Acacia Galpinii* and *Combretum porphyrolepis*, with large mopanes backing them up behind. The course of the river was followed down for just over a mile where its junction with the Nata was found to be a great flat black turf swamp, thickly covered by trees of *Acacia kirkii*. On the edge of this swamp gigantic trees of *Combretum porphyrolepis* and *Lonchocarpus capassa* occurred, and beyond this the country was covered with high mopane forest.

(11) The Junction of the Nata and Maitengwe Rivers, known as the Nata Grazing Grounds.

(*Figures* 69 *to* 76.)

The country at the junction of the Nata and Maitengwe rivers was covered by high mopane forest. The trees were of great size and not too closely spaced, so that a fairly dense covering of grass existed below. In this open forest were long grassy glades and damboes. The former were covered by xerophytic grasses such as *Eragrostis* sp. near *angusta*, *Eragrostis superba* and *Cenchrus ciliaris*; the latter carried a dense rank growth of hygrophyllous grasses, including species of *Echinochloa*, *Panicum*, *Hemarthria* and *Setaria*. The edges of these damboes were frequently lined by gigantic ana trees *Acacia albida*. In addition to these islands of grass in the mopane forest there were also islands of thorn bush mainly consisting of *Acacia Benthami* and *A. litakunensis* and over these localities such grasses as *Panicum meyerianum*, *Panicum coloratum* var., *Setaria* sp. n. *Chloris gayana* and *Digitaria milanjiana* grew in great profusion. In addition to the grasses mentioned there was in this area a great variety of grasses, but owing to the lateness of the season and also to the fact that most of them had been very closely cropped by the large herds of cattle posted here, it was not possible to determine many of them.

PASTURE GRASSES.

The trip has revealed the fact that there are some excellent pastures throughout the eastern portion of the territory. These were observed in the Barolong Farms, on the Bamalete reserve, the Bakhatla reserve, the south eastern portion of the Bamangwato reserve, the Tuli Block, the Tati Concession, north-west of N'Kate, and at the junction of the Nata and Maitengwe rivers.

Overgrazing and overstocking was observed in the Lobatsi Block, the Bamalete reserve, the Tuli Block, the valley of the Mahalapye river, the north eastern portion of the Bamangwato Reserve, on the grazing grounds at the junction of the Nata and Maitengwe rivers, and on the Hunters' Road. The most important pasture grasses noted were *Digitarias* which cover wide areas and of which there are several species and a number of different strains. In nearly all cases these grasses appear to be the first that are eaten out and in many of the places that were overgrazed and overstocked Digitarias could only be found in the shelter of thorn bushes and other places of refuge.

Next in importance and abundance were the *Urochloas* which were widely distributed through the northern portion of the territory. Some magnificent *Urochloa* pasturage was seen in the Tati Concession which in my opinion is the gem of the eastern portion of the Protectorate. A sample of this pasture taken just south of Francistown has revealed on analysis the remarkably high phosphorus content of 1·28 per cent., which so far as I am aware is a record for any indigenous grass so far analysed in Southern Africa. Apart from this, this grass (*Urochloa pullulans*) has a high calcium and protein content, which, added to the fact that the grass is both leafy and succulent, makes it all the more valuable. My observations made on the *Urochloas* encountered on this trip have convinced me that a detailed study of this genus, its different species and many strains of the same species, would well repay investigation both in the herbarium and at the pasture research station. There are great possibilities awaiting cultivation and grazing experiments with this genus.

Another genus which figures prominently in the pastures so far examined in the Protectorate is that of *Panicum*. Several species were found to be widely distributed throughout the area traversed, in some cases more or less scattered amongst other grasses, in other instances *Panicum* sp. dominated the pasture. Reference to the analysis table below will show that all the Panicums examined possessed a high mineral content and yielded consistently high food values.

Briefly it may be stated that the best pastures in the eastern portion of the Bechuanaland Protectorate were found to be composed largely of grasses belonging to the genera *Digitaria*, *Urochloa* and *Panicum*, but so far as our knowledge of these goes at present it is impossible to state which of these is relatively the most important. These were the grasses that were most sought after and grazed by both cattle and game, and representative samples taken of these grasses for analyses have shown that most of them possess the constituents typical of a pasture of high feeding value.

In all fifteen samples of different pastures were taken on the trip, and when it is borne in mind that these were taken at the end of the season when the phosphorus content is usually low, and that a fairly large proportion of old leaves were included in all the samples, which would also naturally lower the percentage figures for at least the phosphorus and protein, the figures obtained must be regarded as highly satisfactory. They are as in table on page 21.

Analysis

of

Grass Samples collected in the Bechuanaland Protectorate, April, 1931.

No.	Grass.	Date.	Locality.	Ash.	P_2O_5.	CaO.	Protein.
1.	*Eragrostis* sp.........	12.4.31	Pilane..........	10·36	0·123	0·336	4·40
2.	*Digitaria Polevansii*..	12.4.31	Kalahari sand south of Artesia.	9·92	0·106	0·840	4·68
3.	*Digitaria* sp..........	12.4.31	Kalahari sand north of Artesia.	10·41	0·093	0·882	3·91
4.	*Anthephora* sp.......	12.4.31	Kalahari sand north of Artesia.	10·50	0·150	0·833	6·06
5.	*Panicum coloratum*...	12.4.31	Kalahari sand north of Artesia.	14·15	0·138	1·02	5·93
6.	*Digitaria* sp. (stoloniferous)	13.4.31	North-east of Debeeti.	11·34	0·284	0·750	7·41
7.	*Panicum maximum*..	13.4.31	North-east of Debeeti.	11·56	0·645	0·875	11·33
8.	*Panicum* (creeping)..	15.4.31	Quarantine Camp, Towani.	13·96	0·402	0·805	12·20
9.	*Digitaria* sp.........	15.4.31	Quarantine Camp, Towani.	12·00	0·329	0·798	9·25
10.	*Urochloa* sp..........	15.4.31	Quarantine Camp, Towani.	15·92	0·389	0·868	9·38
11.	*Eragrostis* sp. (curly).	15.4.31	Quarantine Camp, Towani.	9·88	0·318	0·532	7·70
12.	*Urochloa pullulans*... (broad-leaf)	17.4.31	South of Francistown.	20·32	1·280	1·290	14·79
13.	*Chrysopogon* sp......	17.4.31	South of Tsessebe.	15·13	0·124	0·448	5·69
14.	*Chrysopogon* sp......	20.4.31	North-east of N'Kate.	16·23	0·144	0·497	5·27
15.	*Panicum meyerianum*	22.4.31	Nata Grazing Grounds.	15·50	0·900	0·630	10·71

Samples of soil were also taken at the same time and the same spot as the grass samples and the available P_2O_5 percentage and CaO percentage determinations have been made and are given hereunder :—

Soil Samples—Bechuanaland Protectorate.

Soil Sample No.	Reference Number of grass from them.	Available P_2O_5 percentage.	Available CaO percentage.
1................	1	0·00058	0·076
2................	2	0·00031	0·052
3................	3, 4	0·00054	0·103
4................	6, 7	0·00160	0·158
5................	8, 9, 10, 11	0·00095	0·124
6................	12	0·03704	0·367
7................	13	0·00055	0·078
8................	—	0·0010	0·681
9................	14	0·00032	0·067
10................	15	0·00342	0·259

Comparison of these figures will show that there is some quite definite relationship between the amount of P_2O_5 in soil and in plant and it is worth notice that No. 12 shows the highest figures for both P_2O_5 and CaO in the grass and in the soil, and at the same time it has also the highest protein content.

The following is a list of the living grasses which were collected and which have been brought to Pretoria for cultivation and further study at our Pasture Research Station. As most of this material was not in a sufficiently good condition for critical determination, no attempt is made at this stage to name the species.

No.		*Date.*	*Place Collected.*
1.	*Digitaria* sp...........	10.4.31	Ramathlabama.
2.	*Panicum* sp...........	11.4.31	Ramoutsa.
3.	*Pennisetum* sp.........	11.4.31	Metsimatlaba.
4.	*Digitaria* sp...........	12.4.31	Pilane.
5.	*Digitaria* sp...........	12.4.31	South of Artesia.
6.	*Anthephora* sp.........	12.4.31	Artesia.
7.	*Panicum* sp. (blue)....	12.4.31	Artesia.
8.	*Panicum* sp...........	12.4.31	Artesia.
9.	*Digitaria* sp...........	12.4.31	Marama.
10.	*Panicum* sp...........	12.4.31	Marama.
11.	*Digitaria* sp...........	13.4.31	Palla Ranch.
12.	*Urochloa* sp...........	13.4.31	Palla Ranch.
13.	*Digitaria* sp...........	14.4.31	Mahalapye.
14.	*Urochloa* sp...........	15.4.31	Towani.
15.	*Heteropogon* sp........	15.4.31	Towani.
16.	*Digitaria* sp...........	15.4.31	Towani.
17.	*Panicum* sp...........	15.4.31	Towani.
18.	*Brachiaria* sp.........	15.4.31	Towani.
19.	*Digitaria* sp...........	15.4.31	Towani.
20.	*Urochloa* sp...........	15.4.31	Towani.
21.	*Digitaria* sp...........	17.4.31	Shashi.
22.	Undetermined........	17.4.31	Francistown.
23.	*Choridion* sp..........	17.4.31	Francistown.
24.	*Chrysopogon* sp........	17.4.31	Tsamaea.
25.	*Bothriochloa* sp........	17.4.31	Tsamaea.
26.	*Digitaria* sp...........	18.4.31	Tsessebe.
27.	*Cymbopogon* sp........	18.4.31	Tsessebe.
28.	*Panicum* sp...........	19.4.31	Bushman Mine.
29.	*Digitaria* sp...........	19.4.31	Makarikari Lake (heavy sand).
30.	*Pennisetum* sp.........	19.4.31	Makarikari Lake.
31.	*Eragrostis* sp..........	19.4.31	Makarikari Lake.
32.	*Panicum* sp...........	19.4.31	Makarikari Lake.
33.	*Urochloa* sp...........	19.4.31	Makarikari Lake.
34.	*Digitaria* sp...........	19.4.31	Makarikari Lake.
35.	*Digitaria* sp...........	19.4.31	Nata River (sandy bank).
36.	*Digitaria* sp...........	20.4.31	On heavy sand west of Nata River.
37.	*Panicum* sp	20.4.31	On heavy sand west of Nata River.
38.	*Chrysopogon* sp........	20.4.31	On heavy sand west of Nata River.
39.	*Brachiaria* sp.........	21.4.31	Sebonini River.
40.	*Brachiaria* sp.........	21.4.31	Sebonini River.

No.		Date.	Place Collected.
41.	*Panicum* sp.	21.4.31	Sebonini River.
42.	*Paspalum* sp.	21.4.31	Sebonini River.
43.	Grass undetermined	21.4.31	Sebonini River.
44.	Grass undetermined	21.4.31	Sebonini River.
45.	*Panicum* sp.	21.4.31	Sebonini River.
46.	*Chloridion*	22.4.31	Nata grazing grounds.
47.	Grass undetermined	22.4.31	Nata grazing grounds.
48.	Grass undetermined	22.4.31	Nata grazing grounds.
49.	*Chloris* sp.	22.4.31	Nata grazing grounds.
50.	*Hemarthria* sp.	22.4.31	Nata grazing grounds.
51.	*Echinochloa* sp.	22.4.31	Nata grazing grounds.
52.	*Echinochloa* sp. (small)	22.4.31	Nata grazing grounds.
53.	*Pennisetum* sp.	22.4.31	Nata grazing grounds.
54.	*Digitaria* sp.	22.4.31	Between Nata and Maitengwe rivers.
55.	*Panicum* sp.	23.4.31	Near Plumtree.

TIMBER TREES.

The following are some of the more important timber trees noted :—

Acacia albida.—The Ana tree of South West Africa. Frequent in the Tuli Block and plentiful along the Nata and Maitengwe rivers. The tree is held sacred by the natives and wood said to be of fair quality when the tree is burned down. They yield an abundance of highly nutritious pods which are greedily devoured by nearly all kinds of stock.

Acacia Galpinii.—A large tree 60–70 feet high, frequent in the northern portion of the Tati Concession and in the north-eastern parts of the Protectorate. Wood valuable for wagon building and other purposes.

Acacia pallens.—The knoppies thorn, very plentiful throughout the Limpopo valley and the northern portion of the Protectorate. Reputed to have unusual powers of withstanding veld fires and yields a hard durable timber.

Acacia giraffae.—The camel thorn, plentiful throughout the south-eastern portion of the Protectorate. Yields a dark red-brown, very heavy and strong wood. Not touched by termites. Wood valuable for wagon building and mine props.

Albizzia Harveyi.—A large tree 50–60 feet high, frequent in the northern portions of the Tati Concession and the Protectorate.

Balsamodendron africanum.—Frequent throughout the central and north eastern portion of the Protectorate.

Bolusanthus speciosus.—The " Rhodesian Wisteria ", a tree 20–40 feet high, frequent throughout the northern portion of the Tati Concession. Yields a very strong, durable wood, useful for many purposes. Largely cut out wherever trees obtain any size.

Burkea africana.—The " Rhodesian Ash ", plentiful throughout the more sandy parts of the Protectorate. Yields a most valuable timber for furniture, flooring bricks, wagon-building and general purposes.

Combretum apiculatum.—Commonly known as the " rooibos." Plentiful on the granite soils of the Protectorate. Yields a very strong hard and, tough wood which is not attacked by termites.

Combretum erythrophyllum.—Common on the banks of the Limpopo and Shashi rivers. Yields a tough, easily worked wood, and a valuable gum used in the tanning industry.

Combretum hereroense.—A small tree 15–25 feet high, common throughout the eastern portion of the Protectorate. Yields a very hard and tough wood, most useful for pickaxe handles and spokes, etc.

Combretum imberbe.—A large tree 40–50 feet high, frequent throughout the eastern portion of the Protectorate. Yields an extremely hard, heavy, durable timber which does not split easily. Makes beautiful furniture but is very heavy. Is not attacked by termites.

Copaifera mopane.—A large forest tree abundant in the north-eastern portion of the Protectorate where it forms dense forests often 50–60 feet high. Wood is extremely hard and not suitable for furniture making but very suitable for fencing posts, disselbooms, etc. Ash from the wood yields a high percentage of phosphorus and calcium.

Dalbergia melanoxylon.—A small tree 15–20 feet high, frequent throughout the northern portion of the Tati Concession and further northwards. It yields a heartwood as hard as iron. Wood valuable for musical instruments and such like.

Dombeya densiflora.—A small tree 10–12 feet high, frequent throughout the Tati Concession. Yields an excellent timber which is extremely tough and does not split. Very valuable for wagon building.

Entandophragma caudata.—A large tree 60–100 feet high, frequent on the granite kopjes in the northern parts of the Tati Concession, and known locally as " Tati Mahogany ". Yields a most valuable timber suitable for furniture, etc.

Gardenia thunbergiana.—A small tree 10–25 feet high, frequent in the Tati Concession and plentiful in the Nata and Maitengwe valleys. Yields a very hard and heavy wood.

Kirkia acuminata.—A large tree 20–30 feet high, plentiful on the better drained soils of the northern half of the Protectorate. Abundant in the Tati Concession and east of the Great Makarikari Lake. Yields a white. soft, easily worked timber.

Ptaeroxylon obliquum.—A small tree 15–20 feet high, frequent in the granite kopjes in the northern portion of the Tati Concession. Yields an extremely hard and heavy timber, makes beautiful furniture.

Peltophorum africanum.—A fair sized tree 20–40 feet high, widely distributed throughout the eastern parts of the Protectorate. Yields a most useful and valuable timber. Easily worked, takes a good polish and makes beautiful furniture.

Pterocarpus angolensis.—A large tree 30–50 feet high, frequent in the northern parts of the Tati Concession and further north on the dry, welldrained, sandy soils. Yields a most valuable and useful timber. One of the most beautiful South African timbers for furniture making, etc.

Ricinodendron Rautanenii.—A large tree forming small forests in the extreme north-eastern portions of the Tati Concession and the Protectorate. Timber largely used in West Africa for making native coffins. The trees yield a large crop of nuts which are rich in oil and which are known in commerce as " manketti nuts ". The nuts are much sought after by elephants in the northern parts of the Territory.

Sclerocarya caffra.—A large tree 40–50 feet high, frequent throughout the north-eastern parts of the Protectorate. Yields a soft, white timber, easily worked. Used largely by the natives for stamp blocks, native toys, etc.

Spirostachys africanus.—A large tree often forming dense thickets throughout the eastern portion of the Protectorate. Yields a very valuable and beautifully grained timber, suitable for furniture of the highest quality.

Terminalia sericea.—A large tree 25–40 feet high. Very common throughout the sandy soils of the Protectorate. Yields a close-grained, yellow timber useful for furniture and other purposes.

PREVIOUS COLLECTORS.

The south eastern portion of the Protectorate has for a long time been the scene of many well-known travellers and hunters, including Livingstone, Oates, Pinto, Holub, Selous, Passarge, Schultze, Engler, and Seiner. Most of these were attracted to these parts mainly by the game which abounded in those days and although hunting was often their first objective many of them made valuable references to the vegetation and made some collections of plants as well. Chief amongst these are Oates, Passarge, Schultze, Seiner and Engler.

These travellers are unanimous in their references to the wealth of game in this region, and this may be taken as an indication of a correspondingly rich grazing country.

Although much of our knowledge of the vegetation and flora of the Protectorate is due to these travellers mention should also be made of the valuable work, to which little has been added since, which was carried out by the Lugards in N'gamiland. Of more recent date the Vernay-Lange Kalahari Expedition has made a most exhaustive study of the natural history of the Kalahari. Unfortunately the results of this expedition are not yet available.*

CONCLUSIONS AND RECOMMENDATIONS.

In concluding this report I would like to point out that this rapid survey has shown that the eastern portion of the Bechuanaland Protectorate has pastoral resources of considerable value and not only would they repay further and more detailed investigation, but steps should be taken without delay to preserve them and use them to their best possible advantage. The country is undoubtedly a rich one, but we still have to find out what combination of factors make it so.

Much of the country is being spoilt by overstocking and overgrazing, and this should at all costs be avoided, and can only be done by ascertaining the true carrying capacity of the different types of pasturage and by the institution of better methods of pasture management.

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* Since published in annals of Transvaal Museum 16: 1935.

I believe it has been suggested that a Pasture Station might well be established in the Protectorate for the investigation of these matters. Personally I think much more will be accomplished if pasture or nature reserves were established at suitable spots in the Protectorate. If properly fenced and looked after these would in a very short space of time not only become striking object lessons to both native and white population, but they would in course of time be valuable assets to the country in that they would serve as pasture reserves in times of drought, and, if properly managed, would yield valuable information on the stocking and carrying capacity of different types of veld. They would also serve to preserve much of the fast disappearing fauna and flora of the Protectorate. Apart from the initial cost of fencing such reserves there would be little further expense to the Administration. In fact they might be used as sources of revenue for the letting of grazing, etc.

As an instance of the value of such reserves I have only to refer to the one already in existence, viz., the Quarantine Camp between Mahalapye and Palapye Road, where the conditions of the veld, especially in the neighbourhood of Towani, is a most striking object lesson to anyone who passes through this camp.

A still more striking illustration of the value of a simple fence in preserving the vegetation is to be seen on the north-eastern boundary of the Protectorate on the Hunters' Road. Here, I understand, the boundary fence was erected in 1926. To-day on the Rhodesian side the grass cover stands 6–7 feet high and has a dense undergrowth of good grazing material, whereas on the Protectorate side the grass is only a few inches high and there is much bare ground, due entirely to the overgrazing and tramping brought about by overstocking. This state of affairs is to be seen on the boundary, 20 miles north of Takanya Store. and I would recommend all those interested in the future welfare of the Protectorate to visit this locality and see for themselves the remarkable object lesson which awaits them there. The photographs which were taken at this locality, under not too favourable circumstances for photography at the time, show more or less the sharp line of demarcation which exists at the fence.

Reserves similar to this should be established in the Tuli Block and in some of the more important native reserves where overstocking is going on.

Briefly summarising the direct results of this trip it can be definitely stated that—

(1) It has materially added to our knowledge of the vegetation of the Protectorate.

(2) It has helped considerably to define more clearly the distribution of the vegetation types in Southern Africa.

(3) It has added considerably to our knowledge of the pasture grasses of South Africa.

(4) It has revealed the presence of several highly nutritious pasture grasses in the Protectorate.

(5) It has served to identify several valuable timber trees in use in the Protectorate.

(6) It has shown that considerable overgrazing and overstocking are taking place and recommendations for tackling these are made.

The results of this rapid survey show that the Protectorate possesses many valuable plant assets and how much more is stored within its boundaries can only be ascertained by a more detailed botanical survey of its unexplored parts.

In concluding this report I would like to thank Major Walter Elliott, who has really been the prime mover in bringing about this present survey, for the continued interest which he has shown in matters relating to South African pastures.

I would also especially like to thank my Minister, Gen. the Hon. J. C. Kemp, who not only gave me permission to undertake this work, but who very generously placed at my disposal two assistants and two motor lorries without which the work could not have been undertaken so expeditiously.

I would also like to express my appreciation to His Honour the Resident Commissioner, Col. F. C. Rey, for the keen interest which he has shown in the trip, and in particular I would like to thank Mr. Chase, Chief Government Veterinary Officer to the Protectorate Administration, for the very valuable help and assistance which he rendered me throughout.

I would also like to express a deep debt of gratitude to Mr. H. S. Gordon, resident manager of the Tati Concession, not only for his keen personal interest in my visit to the Protectorate, but also for the valuable information which he gave in the field relating to a number of timber properties and possibilities of trees in the Tati Concession, and also for the handsome and welcome donation of £25 made by his company towards the expenses of my trip.

Finally I would like to thank the two members of my staff, Messrs. Pentz and Howlett, who accompanied me and who, together with Mr. A. C. Douthwaite, worked like Trojans in extricating and digging out our lorries on the wretched roads encountered during the wet weather. Thanks to their perseverance and ingenuity we were able to carry on in spite of all the difficulties encountered.

Pretoria, 27 *July*, 1931.

LIST OF PLANTS COLLECTED IN THE BECHUANALAND PROTECTORATE DURING APRIL 10–22, 1931 BY I. B. POLE EVANS.*

PTERIDOPHYTA.

Ophioglossaceae.

Ophioglossum capense Schl. Near Great Makarikari Lake (19.4.31). Pole Evans, 3268.)

SPERMATOPHYTA.

Gramineae.

Elyonurus argenteus Nees. Towani (15.4.31). Pole Evans, 3214.
N'Kate to Sebonini (21.4.31). Pole Evans, 3308.

Sorghum sudanese Stapf. Sepako Lake (21.4.31). Pole Evans, 3319.

Bothriochloa insculpta (Hochst.) Stapf. Tati Concession (18.4.31). Pole Evans, 3257.

Dichanthium annulatum Stapf. Junction of the Sebonini and Nata (21.4.31). Pole Evans, 3221.
Tati Concession (17.4.31). Pole Evans, 3228.
Great Makarikari Lake (19.4.31). Pole Evans, 3228.
Great Makarikari Lake (19.4.31). Pole Evans, 3282.

Andropogon schirensis, Hochst. Tutumi to Bushman Mine (18.4.31). Pole Evans, 3267.

* Duplicates of this material have been presented to the Royal Botanic Gardens, Kew and to the Herbarium of the Department of Agriculture, Salisbury, Southern Rhodesia.

Hyparrhenia hirta, Stapf. Towani (15.4.31). Pole Evans, 3216.

Hyparrhenia Ruprechtii Stapf. N'Kate to Sebonini (21.4.31). Pole Evans, 3305.

Bakhatla Reserve (12.4.31). Pole Evans, 3156.

Hyparrhenia rufa Stapf. Tutumi to Bushman Mine (18.4.31). Pole Evans, 3266.

Heteropogon contortus, Roem. Schult. Eighteen miles north of Mahalapye (15.4.31). Pole Evans, 3191.

N'Kate to Sebonini (21.4.31). Pole Evans, 3312.

Megaloprotachne albescens Hub. Debeeti (12.4.31). Pole Evans, 3179.

Artesia (12.4.31). Pole Evans, 3163.

Digitaria stolonifera (Stapf) Goossens. Tati Concession (17.4.31). Pole Evans, 3226.

Digitaria glauca var. *bechuanica* Stent. South of Debeeti (12.4.31). Pole Evans, 3177.

Chloridion Cameroni Stapf. Tantabane (17.4.31). Pole Evans, 3241.

Tati Concession (17.4.31). Pole Evans, 3242.

Eriochloa. N'Kate to Sebonini (20.4.31). Pole Evans, 3304.

Eriochloa annulata O. Kuntze. Great Makarikari Lake (19.4.31). Pole Evans, 3280.

Brachiaria serrata (Thunb.) Stapf. Towani (15.4.31). Pole Evans, 3213.

Brachiaria nigropedata (Munro) Stapf. Eighteen miles north of Mahalapye (15.4.31). Pole Evans, 3199.

Brachiaria regularis Stapf. Eighteen miles north of Mahalapye (15.4.31). Pole Evans, 3198.

Urochloa helopus Stapf. Tati Concession (18.4.31). Pole Evans, 3255.

N'Kate to Sebonini (18.4.31). Pole Evans, 3252.

Urochloa pullulans Stapf. Shashi to Francistown (17.4.31). Pole Evans, 3225.

Bakhatla Reserve (12.4.31). Pole Evans, 3160.

Urochloa bolbodes (Steud) Stapf. Eighteen miles north of Mahalapye (15.4.31). Pole Evans, 3192.

Tati Concession (18.4.31). Pole Evans, 3250.

Echinochloa Crus-Galli Beauv. Nata grazing ground (22.4.31). Pole Evans, 3325.

Echinochloa colona (Linn) Link. Tati Concession (18.4.31). Pole Evans, 3258.

Echinochloa pyramidalis (Lam.) Hitch. & Chase. Nata grazing grounds (22.4.31). Pole Evans, 3323.

Panicum kalaharense Mez. Artesia (12.4.31). Pole Evans, 3165.

Panicum coloratum Linn. var. *Makarikariensis* Goossens. Towani (15.4.31). Pole Evans, 3212.

Panicum coloratum Linn. Towani (15.4.31). Pole Evans, 3217.

Panicum minus var. *planifolium* Stapf. Great Makarikari Lake (19.4.31). Pole Evans, 3286.

Cenchrus ciliaris. Linn. Great Makarikari Lake (19.4.31). Pole Evans, 3273.

Sass's Post (14.4.31). Pole Evans, 3187.

Aristida meridionalis Henr. Pilane (12.4.31). Pole Evans, 3157.

Great Makarikari Lake (19.4.31). Pole Evans, 3275.

N'Kate to Sebonini (20.4.31). Pole Evans, 3297.

N'Kate to Sebonini (21.4.31). Pole Evans, 3307.

Aristida barbicollis Trin. & Rupr. Sass's Post (14.4.31). Pole Evans, 3185.

Sass's Post (14.4.31). Pole Evans, 3186.

Eighteen miles north of Mahalapye (15.4.31). Pole Evans, 3206.

Aristida gracilior Pilg. Shashi to Francistown (17.4.31). Pole Evans, 3224.
Great Makarikari Lake (19.4.31). Pole Evans, 3274.
Great Makarikari Lake (19.4.31). Pole Evans, 3284.

Aristida graciliflora Pilg. Eighteen miles north of Mahalapye (15.4.31). Pole Evans, 3207.
Eighteen miles north of Mahalapye (15.4.31). Pole Evans, 3204.

Aristida uniplumis Licht. Bakhatla Reserve (12.4.31). Pole Evans, 3159.
Artesia (12.4.31). Pole Evans, 3172.
Great Makarikari Lake (19.4.31). Pole Evans, 3283.
Great Makarikari Lake (19.4.31). Pole Evans, 3287.
N'Kate to Sebonini (20.4.31). Pole Evans, 3298.
N'Kate to Sebonini (20.4.31). Pole Evans, 3302.

Aristida angustata Stapf. Tantabane (17.4.31). Pole Evans, 3240.
Towani (15.4.31). Pole Evans, 3215.

Aristida adscensionis Linn. Eighteen miles north of Mahalapye (15.4.31). Pole Evans, 3205.

Aristida Pilgeri Henr. N'Kate to Sebonini (21.4.31). Pole Evans, 3309.

Perotis indica (Linn) O. Kuntze. Artesia to Debeeti (12.4.31). Pole Evans, 3174.

Sporobolus bechuanicus Goossens. Great Makarikari Lake (19.4.31). Pole Evans, 3277.
Great Makarikari Lake (19.4.31). Pole Evans, 3279.

Sporobolus sp. Great Makarikari Lake (19.4.31). Pole Evans, 3272.

Eragrostis Lehmanniana ? Banks of the Nata River (19.4.31). Pole Evans, 3289.

Eragrostis biflora Hack. Tati Concession (17.4.31). Pole Evans, 3243.

Eragrostis superba Peyr. Artesia (12.4.31). Pole Evans, 3171.
N'Kate to Sebonini (21.4.31). Pole Evans, 3313.

Eragrostis pallens Hack. Pilane to Tsamma (12.4.31). Pole Evans, 3158.

Pogonarthria squarrosa Pilger. Eighteen miles north of Mahalapye (15.4.31). Pole Evans, 3201.
Artesia (12.4.31). Pole Evans, 3166.

Enneapogon mollis Lehm. Sass's Post (14.4.31). Pole Evans, 3184.
Great Makarikari Lake (19.4.31). Pole Evans, 3281.

Schmidtia bulbosa Stapf. Eighteen miles north of Mahalapye (15.4.31). Pole Evans, 3200.
N'Kate to Sebonini (20.4.31). Pole Evans, 3296.

Enteropogon macrostachya Munro. Hunters' Road (22.4.31). Pole Evans, 3327.

Chloris gayana Kunth. Junction of Sebonini and Nata (22.4.31). Pole Evans, 3322.

Chloris virgata Swartz. Palla Ranch (14.4.31). Pole Evans, 3183.
Eighteen miles north of Mahalapye (15.4.31). Pole Evans, 3196.

Dactyloctenium aegyptium (L) Rich. Banks of Nata River (19.4.31). Pole Evans, 3288.

Dinebra arabica Jacq. Banks of Sebonini River (21.4.31). Pole Evans, 3318.

Triraphis andropogonoides (Steud) Phill. Artesia (14.4.31). Pole Evans, 3175.

Setaria Gerrardii Stapf. Francistown (17.4.31). Pole Evans, 3227.

Palmae.

Hyphaene sp. N'Kate (21.4.31). Pole Evans, 3306.

Chenopodiaceae.

Suaeda fruticosa Forsk. Great Makarikari Lake (19.4.31). Pole Evans, 3278.

Portulacaceae.

Anacampseros Bremekampii Polnitz. Tantabane (17.4.21). Pole Evans, 3239.

Capparidaceae.

Boscia sp. Hunter's Road (22.4.31). Pole Evans, 3326.

Leguminoseae.

Albizzia Harveyii Fourn. Tantabane (17.4.31). Pole Evans, 3232.
Tati Concession (17.4.31). Pole Evans, 3230.
Acacia Rehmanniana Schinz. Tati River (18.4.31). Pole Evans, 3257.
Acacia seyal var. *multijuga*. Tati River (18.4.31). Pole Evans, 3251.
Acacia pallens Rolfe. Palla Ranch (13.4.31). Pole Evans, 3181.
Acacia rostrata Sim. Dikhatlon Ranch (14.4.31). Pole Evans, 3189.
Acacia dulcis N. E. Brown. Mahalapye (14.4.31). Pole Evans, 3190.
Makalameedi (21.4.31). Pole Evans, 3316.
Acacia eriadenia Benth. South of Lobatsi (10.4.31). Pole Evans, 3152.
Acacia Kirkii Oliv. Sepako Lake (21.4.31). Pole Evans, 3317.
Acacia retinens Sim. Artesia (12.4.31). Pole Evans, 3170.
Copaifera mopane Kirk. Seruli (16.4.31). Pole Evans, 3219.
Bauhinia reticulata D.C. Mitengwe River (22.4.31). Pole Evans, 3329.
Crotalaria nubica Benth. Tati River (18.4.31). Pole Evans, 3253.
Artesia (12.4.31). Pole Evans, 3169.
N'Kate to Sebonini (21.4.31). Pole Evans, 3310.
Sesbania Rogersii Phill & Hutch. Junction of Nata and Sebonini Rivers (21.4.31). Pole Evans, 3320.
Ormocarpum trichocarpum Taub. Tantabane (17.4.31). Pole Evans, 3235.
Ormocarpum sp. Plumtree (23.4.31). Pole Evans, 3335.
Dalbergia melanoxylon G. & P. Tantabane (17.4.31). Pole Evans, 3238.
Lonchocarpus laxiflora ? Hunters' Road (22.4.31). Pole Evans, 3328.

Berseraceae.

Commiphora Welwitschii Engl. Eighteen miles north of Mahalapye (15.4.31). Pole Evans, 3202.

Macloutsie (16.4 31). Pole Evans, 3221.

Commiphora Fischeri Engl. Tantabane (17.4.31). Pole Evans, 3233.
Plumtree (23.4.31). Pole Evans, 3334.

Meliaceae.

Pteroxylon obliquum Radlk. Tati Concession (18.4.31). Pole Evans, 3264.
Tantabane (17.4.31). Pole Evans, 3237.

Entandophragma caudata. Tsessebe (18.4.31). Pole Evans, 3250.

Euphorbiaceae.

Pseudolachnostylis maprouneifolia Pax. Tsessebe (18.4.31). Pole Evans, 3245.
Bridelia mollis Hutch. Tati Concession (18.4.31). Pole Evans, 3263.
Ricinodendron rautanenii Schinz. N'Kate to Sebonini (21.4.31). Pole Evans, 3314.
Euphorbia espinosa Pax. Tsessebe (18.4.31). Pole Evans, 3249.
Tsessebe (18.4.31). Pole Evans, 3248.

Anacardiaceae.

Rhus commiphoroides. Engl. & Gilg, Nata River (20.4.31). Pole Evans, 3290.
Nata River (20.4.31). Pole Evans, 3291.

Celastraceae.

Gymnosporia peduncularis ? Tsessebe (17.4.31). Pole Evans, 3246.

Sapindaceae.

Cardiospermum halicacabum Linn., South of Messina (27.4.31). Pole Evans, 3337

Rhamnaceae.

Marlothia spartioides Engl. Artesia (12.4.31). Pole Evans, 3162.

Tiliaceae.

Grewia caffra Meisn. Makalameedi (21.4.31). Pole Evans, 3315.
Artesia (12.4.31). Pole Evans, 3164.
Grewia pilosa Lam. Shashi to Francistown (17.4.31). Pole Evans, 3222.
Grewia villosa Willd. Messina (26.4.31). Pole Evans, 3336.
Grewia sp. Prob. n. sp. Artesia (12.4.31). Pole Evans, 3168.
Grewia sp. prob. n. sp. Nata River (20.4.31). Pole Evans, 3292.

Malvaceae.

Gossypium transvaalense Watt. N'Kate to Sebonini (21.4.31). Pole Evans, 3311.

Flacourtiaceae.

Flacourtia hirtiuscula Oliv. Tantabane (17.4.31). Pole Evans, 3234.
Plumtree (22.4.31). Pole Evans, 3330.

Combretaceae.

Combretum apiculatum Sond Dikhatlon Ranch (14.4.31). Pole Evans, 3188.
Eighteen miles north of Mahalapye (15.4.31). Pole Evans, 3203.
Combretum hereroense Schinz. Debeeti (13.4.31) Pole Evans, 3180.
Ramoutsa's Stad (11.4.31). Pole Evans, 3153.
Combretum suluense. Tantabane (17.4.31). Pole Evans, 3236.
Terminalia Randii Tutumi to Bushman Mine (18.4.31). Pole Evans, 3265.
Tsessebe (17.4.31). Pole Evans, 3244.

Ebenaceae.

Euclea multiflora Hiern. Tati Concession (18.4.31). Pole Evans, 3262.
Euclea sp. Tati Concession (18.4.31). Pole Evans, 3261.

Boraginaceae.

Heliotropium Nelsoni Wright. Towani (15.4.31). Pole Evans, 3210.

Verbenaceae.

Clerodendron glabrum E. Mey. Tantabane (17.4.31). Pole Evans, 3231.
Tati Concession (18.4.31). Pole Evans, 3260.

Labiateae.

Tinnea rhodesiana S. Moore. Hunter's Road (23.4.31). Pole Evans, 3332

Solanaceae.

Lycium sp. Macloutsie (16.4.31). Pole Evans, 3220.

Bignoniaceae.

Rhigozum brevispinosum O. Kuntze. Nata River (20.4.31). Pole Evans, 3294.
Cataphractes Alexandri D. Don. Shashi to Francistown (17.4.31). Pole Evans, 3223.

Acanthaceae.

Dyschoriste sp. Tsessebe (18.4.31). Pole Evans, 3247.
Ruspolia sp. Wyllies Poort (28.4.31). Pole Evans, 3338

Rubiaceae.

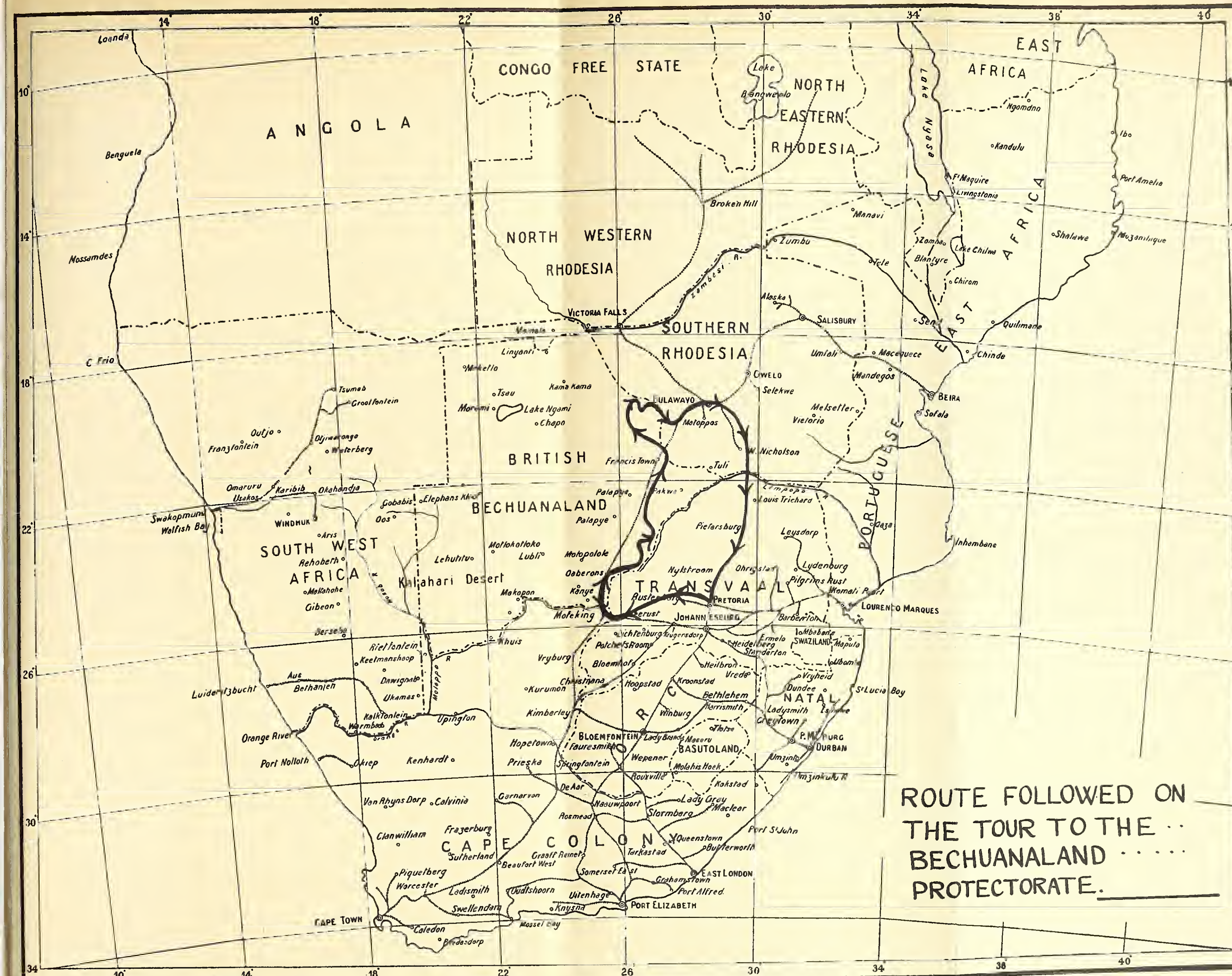
Crossopteryx sp. Plumtree (23.4.31). Pole Evans, 3331.

Cucurbitaceae

Cucumis hirsutus Sond. Towani (15.4.31). Pole Evans, 3211.

Compositeae.

Vernonia Gerrardi Harv. Towani (15.4.31). Pole Evans, 3209.
Vernonia glabra Vatke. Eighteen miles north of Mahalapye (15.4.31). Pole Evans, 3208.
Vernonia steetziana O. & H. Tsamma (12.4.31). Pole Evans, 3161.
Blumea gariepina DC. Tsessebe (18.4.31). Pole Evans, 3259.
Geigeria protensa Harv. Debeeti (12.4.31). Pole Evans, 3176.
Berkheyopsis bechuanensis S. Moore. Debeeti (12.4.31). Pole Evans, 3175.


ROUTE FOLLOWED ON THE TOUR TO THE BECHUANALAND PROTECTORATE.
ANGOLA
CONGO FREE STATE
NORTH EASTERN RHODESIA
EAST AFRICA
NORTH WESTERN RHODESIA
SOUTHERN RHODESIA
BRITISH BECHUANALAND
SOUTH WEST AFRICA
TRANSVAAL
PORTUGUESE EAST AFRICA
NATAL
BASUTOLAND
CAPE COLONY
Kalahari Desert
Loanda
Benguela
Mossamedes
C Frio
Victoria Falls
Broken Hill
Salisbury
Gwelo
Bulawayo
Beira
Chinde
Quilimane
Zumbu
Lake Ngami
Francis Town
Palapye
Tuli
Pietersburg
Pretoria
Johannesburg
Mafeking
Lourenco Marques
Windhuk
Swakopmund
Walfish Bay
Kimberley
Bloemfontein
Durban
East London
Port Elizabeth
Cape Town
Mossel Bay
Knysna
Upington
Orange River
Port Nolloth
St Lucia Bay
Inhambane

Bignoniac

Rhigozu
Cataphr
322

Acanthac

Dyschor
Ruspoli

Rubiaceae

Crossop

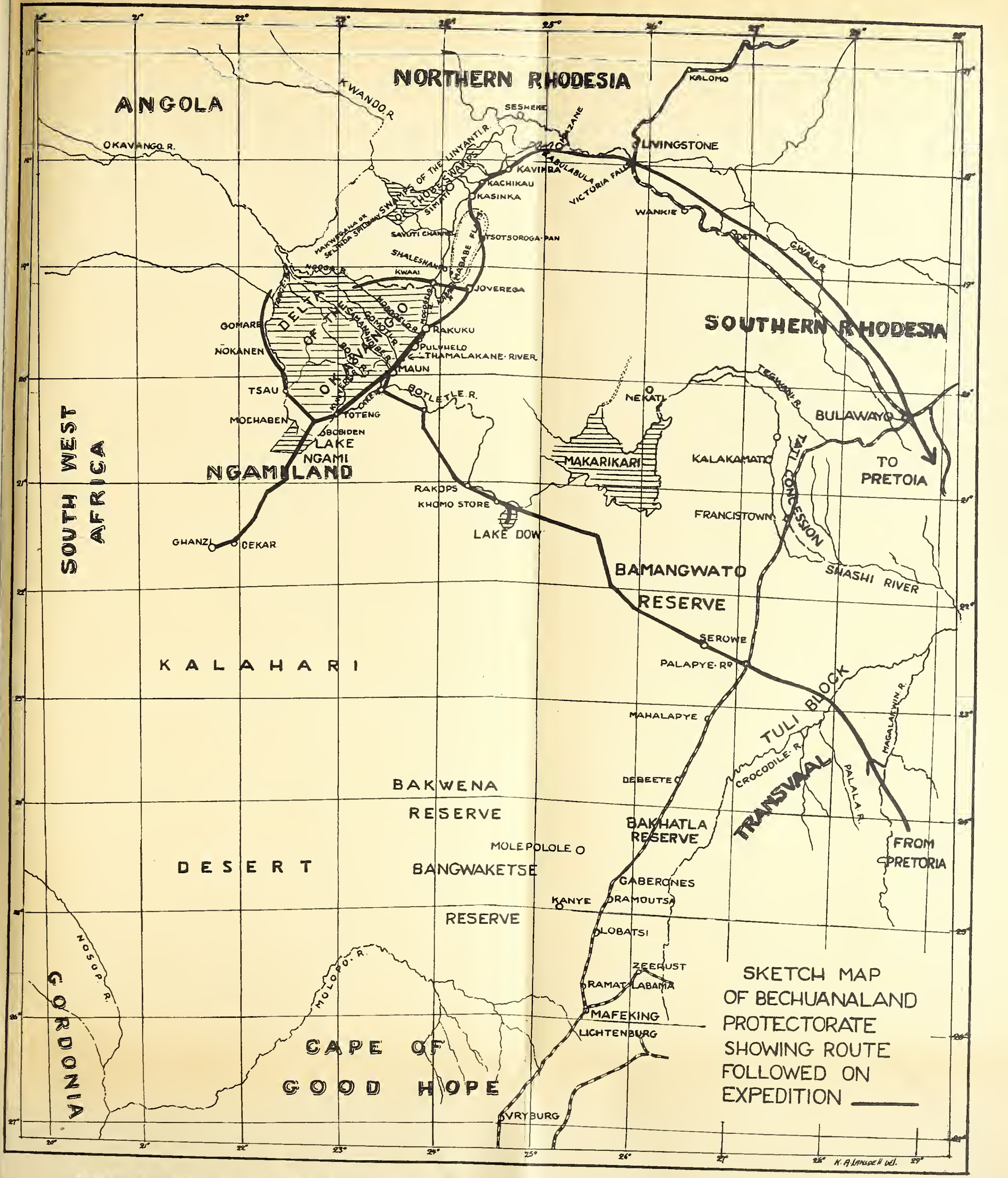
Cucurbita

Cucumi

Composite

Vernon
Vernon
Ev
Vernon
Blumea
Geigeria
Berkhey

MAP. NO. 2.



NGAMILAND EXPEDITION FROM JUNE 7 — JULY 19-1937.

Bignonia

Rhigoz
Cataph
32

Acanthac

Dyscho
Ruspol

Rubiacea

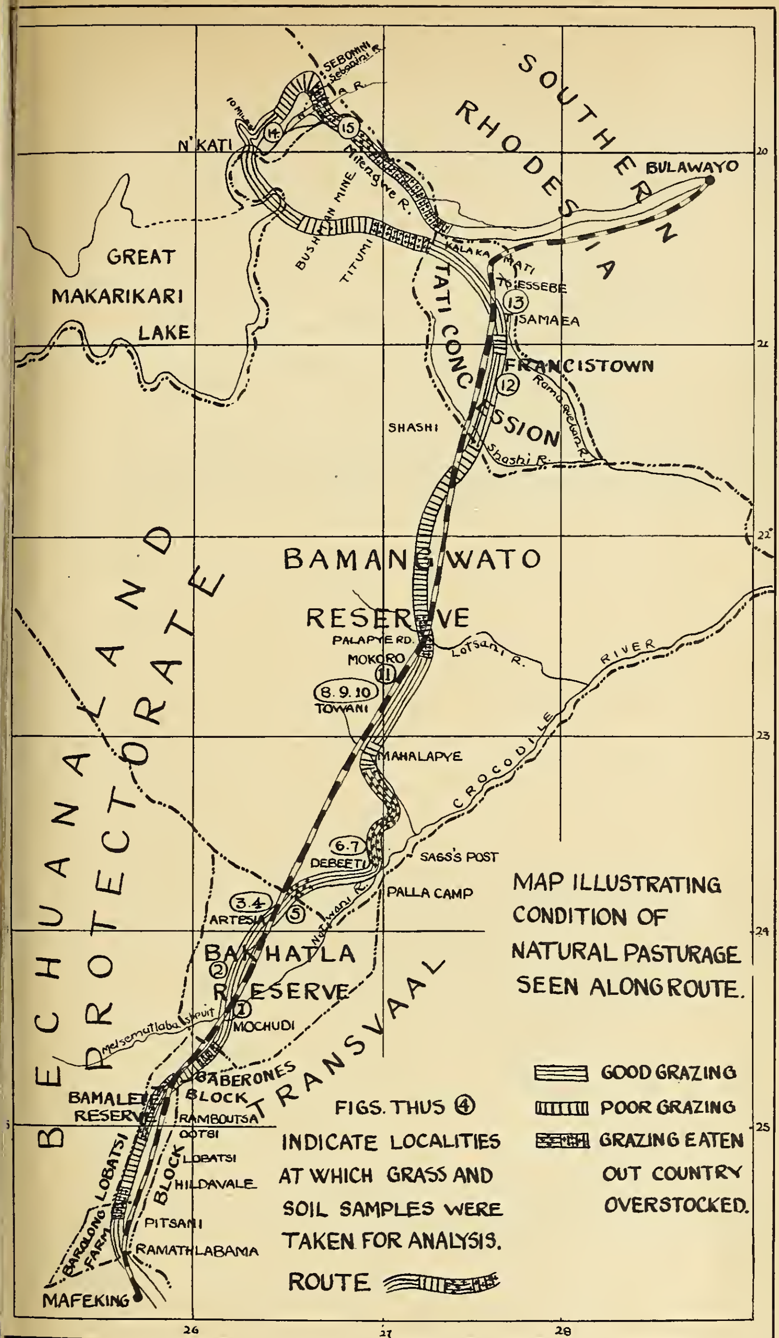
Crosso

Cucurbita

Cucum

Composit

Vernon
Vernon
E
Vernon
Blume
Geigeri
Berkhe


SOUTHERN RHODESIA
BULAWAYO
N'KATI
SEBOMNI
GREAT MAKARIKARI LAKE
BUSHMAN MINE
TITUMI
KALAKA
MATI
TATI CONCESSION
TSESSEBE
SAMAEA
FRANCISTOWN
Ramaquaban R.
SHASHI
Shashi R.
BAMANGWATO RESERVE
PALAPYE RD.
MOKORO
TOWANI
Lotsani R.
MAHALAPYE
CROCODILE RIVER
SAGS'S POST
DEBEETI
PALLA CAMP
ARTESIA
BECHUANALAND PROTECTORATE
BAKHATLA RESERVE
MOCHUDI
TRANSVAAL
GABERONES BLOCK
BAMALETE RESERVE
RAMBOUTSA
OOTSI
LOBATSI
HILDAVALE
LOBATSI BLOCK
PITSANI
RAMATHLABAMA
BAROLONG FARM
MAFEKING
20
21
22
23
24
25
26
27
28
MAP ILLUSTRATING CONDITION OF NATURAL PASTURAGE SEEN ALONG ROUTE.
GOOD GRAZING
POOR GRAZING
GRAZING EATEN OUT COUNTRY OVERSTOCKED.
FIGS. THUS ④ INDICATE LOCALITIES AT WHICH GRASS AND SOIL SAMPLES WERE TAKEN FOR ANALYSIS.
ROUTE

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Ac

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Fig. 1.—*Acacia giraffae* and *Grewia cana* with grass composed of *Eragrostis Lehmanniana, Schmidtia bulbosa, Brachiaria nigropedata* and *Digitaria*.

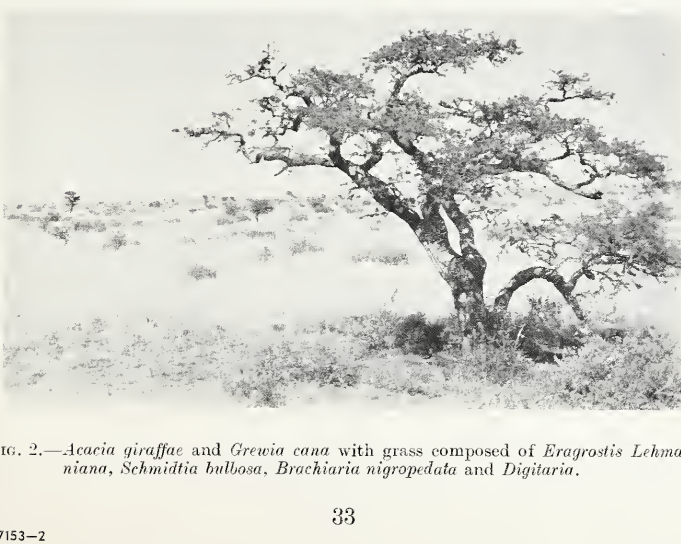

Fig. 2.—*Acacia giraffae* and *Grewia cana* with grass composed of *Eragrostis Lehmanniana, Schmidtia bulbosa, Brachiaria nigropedata* and *Digitaria*.

Fig. 3.—*Acacia giraffae*, *Grewia cana* and *Aristida Burkei*.

THE LOBATSI BLOCK.

Fig. 4.—View from Hilda Vale looking north to Lobatsi. The bush consists of *Acacia litakunensis*, *A. Karroo*, *A. detinens*, *A. Benthami*, *Heeria paniculosa*, *Vitex Zeyheri*, *Rhus lancea*, *Peltophorum africanum*, *Euclea lanceolata*, *Zizyphus mucronata*, *Royena pallens* and *Tarchonanthus camphoratus*. The grass in the foreground is mainly *Eragrostis Lehmanniana*.

THE BAMALETE RESERVE.

Fig. 5.—View from Ootsi (in the rain) looking north. *Combretum hereroense*, *Pappea fulva* and *Peltophorum africanum* in the foreground, *Acacia litakunensis* thickets in the distance.

THE BAKHATLA RESERVE.

Fig. 6.—*Terminalia sericea* in foreground, *Acacia detinens*, *Peltophorum africanum* and *Grewia cana* beyond. Grass is mainly *Eragrostis pallens* and *Digitaria Polevansii*.

FIG. 7.—*Terminalia sericea, Grewia cana, Acacia giraffae* and *Peltophorum africanum.* The grass is *Eragrostis pallens, Digitaria Polevansii* and *Pogonarthria squamosa.*

FIG. 8.—*Boscia albitrunca, Acacia giraffae, A. detinens* and *Terminalia sericea* in grass composed of *Eragrostis pallens, Digitaria Polevansii* and *Pogonarthria squamosa.*

Fig. 9.—*Acacia giraffae* and *Grewia cana*, with *Eragrostis pallens* and *Digitaria Polevansii.*

Fig. 10.—*Acacia detinens* in grass composed of *Eragrostis pallens*, *Aristida uniplumis*, *Anthephora pubescens* and *Digitaria Polevansii.*

Fig. 11.—*Acacia detinens*, *A. litakunensis*, *A. giraffae* and *Zizyphus mucronata* with grass composed of *Digitaria Polevansii*, *Aristida uniplumis*, *Anthephora pubescens* and *Schmidtia bulbosa*.

Fig. 12.—*Acacia dulcis* with *Digitaria Polevansii* in foreground, near Artesia.

Fig. 13.—*Digitaria Polevansii* near Artesia.

Fig. 14.—*Acacia detinens, A. dulcis, A. litakunensis* and *A. giraffae* with grass composed of *Aristida uniplumis, Digitaria Polevansii* and *Enneapogon scoparius.*

Fig. 15.—*Boscia albitrunca, Acacia detinens, A. litakunensis, A. giraffae* and *Commiphora pyracanthoides* in foreground. Grass is mainly *Digitaria Polevansii* and *Urochloa pullulans*. Palla ranch.

Fig. 16.—*Grewia caffra, Acacia litakunensis* and *A. giraffae*. Grass is *Eragrostis Lehmanniana*.

FIG. 17.—*Acacia litakunensis, A. giraffae* and *Grewia caffra*. Grass is mainly *Enneapogon mollis.*

THE BAMANGWATO RESERVE.

THE SOUTHERN PORTION.

FIG. 18.—*Combretum imberbe, Grewia cana, Euclea lanceolata* and *Tarchonanthus camphoratus.* Grass is mainly *Aristida uniplumis* and *Digitaria Polevansii.*

Fig. 19.—*Combretum imberbe*, *Grewia cana* and *Tarchonanthus camphoratus*. Grass is *Aristida uniplumis* and *Schmidtia bulbosa*.

Fig. 20.—*Combretum imberbe*, *Acacia detinens* and *Grewia cana*. Grass is mainly *Eragrostis pallens* and *Digitaria Polevansii*.

FIG. 21.—Thickets of *Spirostachys africanus.*

FIG. 22.—Fine timber trees of *Spirostachys africanus.*

Fig. 23.—*Acacia detinens*, *A. litakunensis* and *Combretum hereroense* with *Panicum coloratum* in foreground.

Fig. 24.—*Grewia caffra*, *Acacia litakunensis*, *Dichrostachys nutans* and *Combretum hereroense* with *Panicum coloratum* in foreground.

Fig. 25.—*Kirkia acuminata, Copaifera mopane* and *Dalbergia melanoxylon.* Grass in foreground is mainly *Brachiaria nigropedata* between Tutumi and Bushman Mine.

Fig. 26.—*Kirkia acuminata* and *Copaifera mopane.* Near Bushman Mine.

Fig. 27.—*Crinum Rautanenianum* and *Copaifera mopane*. Near Great Makarikari Lake.

Fig. 28.—*Crinum Rautanenianum*. Near Great Makarikari Lake.

Fig. 29.—*Crinum* sp. prob. *C. leucophyllum Bkr.* Near Great Makarikari Lake.

Fig. 30.—*Copaifera mopane* forests near Great Makarikari Lake.

Fig. 31.—*Copaifera mopane* forests near Great Makarikari Lake.

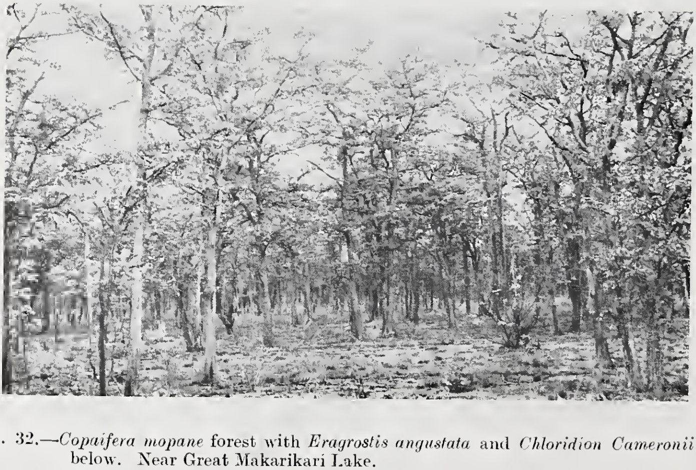

Fig. 32.—*Copaifera mopane* forest with *Eragrostis angustata* and *Chloridion Cameronii* below. Near Great Makarikari Lake.

FIG. 33.—Our caravan in difficulties at Shashi Drift.

FIG. 34.—Getting out of Shashi Drift.

Fig. 35.—*Kirkia acuminata* in the valley of the Inchwe.

Fig. 36.—*Lannea discolor* in the Valley of the Inchwe.

Fig. 37.—*Diplorrhynchus mossambicensis* in the Valley of the Inchwe.

Fig. 38.—Fruits of the Tati mahogany *Entandophragma caudata* from the valley of Inchwe.

Fig. 39.—The Valley of the Tati.

Fig. 40.—*Sterculia tomentosa* in the Valley of the Vukwe.

Fig. 41.—The Valley of the Vukwe. The trees are mostly *Acacia pallens.*

Fig. 42.—*Acacia Galpinii* in the Valley of the Vukwe.

FIG. 43.—*Sterculia tomentosa* in the Shashi Valley.

FIG. 44.—*Copaifera mopane* and *Urochloa pullulans* in the Shashi Valley.

Fig. 45.—*Copaifera mopane* and *Urochloa pullulans* in the Shashi Valley.

Fig. 46.—*Copaifera mopane* and *Digitaria eriantha* in the Shashi Valley.

Fig. 47.—*Commiphora Welwitschii* in the Shashi Valley.

THE GREAT MAKARIKARI LAKE.

Fig. 48.—*Hyphaene crinita* and *Copaifera mopane* near edge of Lake.

FIG. 49.—Edge of north-eastern arm of Lake. Grass is mainly *Sporobolus pungens*.

FIG. 50.—North-eastern portion of Lake.

FIG. 51.—The Nata near its junction with the Great Makarikari.

FIG. 52.—*Albizzia Harveyi* on the Nata.

Fig. 53.—Crossing the Nata.

Fig. 54.—Crossing the Nata.

Fig. 55.—*Aristida Burkei* on grassy plain.

Fig. 56.—Water hole at N'Kate.

FIG. 57.—Pure stand of *Digitaria Polevansii* and *Combretum imberbe*.

FIG. 58.—*Albizzia Harveyi* and *Combretum imberbe*.

FIG. 59.—*Hyphaene* savannah with *Combretum imberbe* and *Sclerocarya caffra.*

FIG. 60.—*Hyphaene* savannah with tall *Hyparrhenia* and *Aristida.*

FIG. 61.—*Hyphaene* savannah with *Sclerocarya caffra*.

FIG. 62.—Our lorry falls into an ant-bear hole in the palm savannah.

Fig. 63.—Trying to follow the spoor in the tall grass savannah.

Fig. 64.—*Adansonia digitata* in short *Copaifera mopane* bush.

Fig. 65.—*Ricinodendron Rautanenii* forests the favourite haunt of elephants.

Fig. 66.—*Ricinodendron Rautanenii* and *Copaifera mopane*.

7153—3.

Fig. 67.—Sepako Lake on the Sebonini river. *Acacia Galpinii* and *A. Kirkii* behind.

Fig. 68.—High *Copaifera mopane* forest on the banks of the Sebonini river.

Fig. 69.—*Copaifera mopane* forest.

Fig. 70.—*Copaifera mopane* forest, showing overgrazing that has taken place.

FIG. 71.—Camp in the Nata grazing grounds.

FIG. 72.—Camp in the Mopane forests of the Nata grazing grounds.

FIG. 73.—Drying the grass samples for analysis at the Nata Camp.

FIG. 74.—*Acacia albida* at the edge of a large dambo, Nata grazing grounds.

FIG. 75.—Island of *Setaria* n. sp. in the Mopane forest.

FIG. 76.—The Maitengwe river.

FIG. 77.—Boundary fence between Southern Rhodesia and the Bechuanaland Protectorate, showing effect of stocking in latter territory.

FIG. 78.—Boundary fence between Southern Rhodesia and the Bechuanaland Protectorate, showing effect of stocking in latter territory.

Fig. 79.—Boundary fence between Southern Rhodesia and the Bechuanaland Protectorate, showing effect of stocking in latter territory.

Fig. 80.—Boundary fence between Southern Rhodesia and the Bechuanaland Protectorate, showing effect of stocking in latter territory.

FIG. 81.—An all wood wagon used for transport by natives near the Great Makarikari Lake. Members of my party on board. Left to right: Messrs. J. C. Howlett. A. C. Douthwaite and J. A. Pentz.

An Expidition to Ngamiland June-July, 1937.

CONTENTS.

AN EXPEDITION TO NGAMILAND

JUNE—JULY, 1937.

INTRODUCTION.

During an expedition which the Government of the Union of South Africa sent to Ngamiland in June and July, 1937, for the purpose of making pasture grass collections, some observations were made on the effect produced by the occupation of man and his grazing animals on the vegetation in this arid land and on the bearing which this has on the water relations in these parts. Many speculations and theories have been advanced to explain the previous existence and present drying up and even disappearance of vast stretches of water in this area. In this present account I give an entirely new explanation as my contribution to the solution of this problem and one which has the facts of observation and biological science to support it. I shall confine myself in this account to the botanical, biological and historical evidence which bears on the subject—the grasses, pastures and pure botany I have dealt with elsewhere.

The personnel of the expedition consisted of myself, three officers of my staff, a wireless operator, and a constable-mechanic. Our transport consisted of a caravan built on a $1\frac{1}{2}$ ton Dodge truck, a $1\frac{1}{2}$ ton Chevrolet truck, and a Ford V-8 car.

The route followed is indicated on the accompanying maps, Ngamiland, in the north-western portion of the Bechuanaland Protectorate, being our objective. Having traversed the desert to Maun, the headquarters of the Bechuanaland Administration in Ngamiland, the expedition proceeded in a south-westerly direction to Lake Ngami and from there to Ghanzi near the South West African border. After exploring this dry tract of country, known as the Kalahari Region, the expedition turned its attention to the alluvial plains and swamps formed by the deltas of the Okovango River and the Linyanti River or Chobe, and then returned via the Victoria Falls to Pretoria.

NGAMILAND.

General Review.

Ngamiland is the name given to the country situated in the north-western portion of the Bechuanaland Protectorate. It lies roughly between latitudes 18° and 22° south, and longitudes 20° and 26° east. It is therefore well within the tropics.

Ngamiland, like the country of which it forms a part, is essentially a native territory or Native Reserve. The natives are composed chiefly of the Makuba of Bantu origin who, during the early part of the eighteenth century, lived on the Linyanti River; the Batawana, an offshoot of the Bamangwato (Khama's people), who are the ruling race today; the Mampukushu who occupy the swamps of the Okovango, north of latitude 19°; the Mosarwa or Bushmen; and the Damaras who are said to be steadily invading the country from South West Africa.

The Makuba, who inhabit the swamps chiefly, are fishermen first and foremost, and tillers of the land. They are the servants of the Batawana and more frequently than not look after their cattle posts for them. The Batawana are essentially the cattle farmers of the country. They also grow maize, kaffir corn, millet and pumpkins whenever opportunity offers.

The Mampukushu, who came from the Upper Chobe at the beginning of the nineteenth century, are essentially deep-water natives and occupy the upper reaches of the Okovango as far north as Andara. They own large herds of cattle; in addition they cultivate the soil and grow maize, millet, kaffir corn, large quantities of ground nuts and tobacco.

The Mosarwa or Bushmen consist of two groups, those who occupy the sandveld or dry Kalahari country and are essentially hunters of game, and those who occupy the swamps and live largely on fish. The Damaras are chiefly stockmen.

A census taken in 1921 of the Batawana Reserve gave the total native population as just over 17,000, with 104,000 head of cattle.

The Makuba number 11,000, the Batawana number 1,500, the Mampukushu number 4,000 and the Bushmen and Damaras make up the rest.

The topography of Ngamiland is of exceptional interest. The main feature is the great Okovango swamp lying in the comparatively flat, sandy desert at an altitude of 3,000–3,300 feet. This swamp is created by the Okovango River which rises in the highlands of Angola to the north, enters the Caprivi strip at Andara, and then travels through Ngamiland for a distance of about 60 miles as a great, powerful, perennial river, before it breaks up and floods a vast area of country of approximately 7,000 square miles. To the north-east of this Okovango swamp is another swamp of considerable dimensions—the Chobe swamp or Linyanti swamp. It is fed mainly by the Kwando River, which also rises in the Highlands of Angola to the north. This Chobe swamp is connected with its neighbour, the Okovango swamp, by the Makwegana or Selinda spillway.

In normal seasons the Okovango River begins to flood the southern portion of its delta from July onwards and begins to recede towards the latter part of September, while the floods of the Linyati River, when the expedition reached them in early July, had already receded very considerably. Although both rivers rise in the Angola Highlands, the Okovango is remarkable in that its waters never reach the ocean; they expend themselves in the swamps of the Okovango delta, whereas the Linyanti eventually joins the Zambesi as a river of considerable proportions some fifty miles north-west of the Victoria Falls.

In addition to these two gigantic swamps—the largest in Southern Africa—Ngamiland possesses two well-known depressions of considerable interest. The one, Lake Ngami, after which Ngamiland takes its name, is situated at the southern end of the Okovango delta, while the other, the Mababe Flats, lies at the north-eastern extremity of the delta. Lake Ngami is usually associated with the name of Livingstone and his colleagues, Oswell and Murray, while the Mababe Flats are renowned for the herds of wild animals that they carry.

These two depressions, which are just over 100 miles apart, are connected by two river systems forming an arc to the delta along its eastern front. About one-third of that distance from Lake Ngami they unite to form the Botletle River which turns eastwards through the sandy Kalahari to empty its water into the Great Makarikari Salt Pan.

Apart from this the country is extraordinarily flat and featureless. In the south are a few hills, the most conspicuous of which are the Kwebe Hills, about twenty miles south of the eastern end of Lake Ngami, and the Mabeleapudi Hills at a similar distance from the western end. East of the Chobe swamp are two rather similar sets of hills, the Gubatsa Hills and the Goha Hills, a distance of about 15 miles apart.

The geological formations of Ngamiland are for the most part buried below Tertiary and recent deposits of sand, except for the few hills mentioned above, and the rocky outcrops around Ghanzi and along the southern side of Lake Ngami. The latter are mostly felspathic sandstones probably of the Waterberg age, while the former are all volcanic, comparable to the Rooiberg felsites.

The soils throughout are mostly sandy—red and yellow sands predominate—except in the neighbourhood of the swamps, where the sand is white, having had its colour removed through the action of water. In the south-western portion of Ngamiland, in the neighbourhood of Ghanzi, tufaceous limestone protrudes from beneath the sand mantle. In the swamps all grades of dark soils are met with containing humus in varying proportions and grading down to pure peat.

The rainfall over Ngamiland varies from 14 inches in the neighbourhood of Lake Ngami, to 23 inches at Andara, and 26 inches at Kasane in the north-east. Most of this falls during December to March and is largely from thunder storms. The heat is often intense before the rains fall and the evaporation must be enormous during the dry months. Slight frosts occur during July. Considerable wind occurs, the prevailing winds being from the north and north-east.

The vegetation is of the type known as parkland. On the Kalahari sand, under low rainfall, it is typical thorn country, consisting mostly of various species of *Acacia* bush with dense tufts of grass widely spaced. In areas of higher rainfall orchard country and open woodland vegetation occur. The orchard country is composed of thorn bush, scattered trees and tall grass, while the open woodland vegetation consists of thorn forests, mopane forests and *Berlinia* and *Brachystegia* forests. Camel thorn forests clothe the western and southern borders of the Okovango delta, while mopane forest covers the country adjoining the eastern and northern sections of the great swamp.

In the perennially flooded area groups of tall palms and gigantic trees form islands, surrounded by rank growth of papyrus swamps and tall grass and reeds, while around the margin of this area a belt of fringing forest occurs.

Ngamiland has been in the public eye for the past 20 years, mainly under the guise of what was known as "Schwartz's Kalahari Scheme". The late Professor Schwartz in January, 1918, put forward the theory that the Zambesi, by capturing the waters of the Chobe, had been responsible for draining away the waters of the Okovango delta, including those of Lake Ngami, and that in like manner Etosha Pan to the west had also been deprived of its waters from the Cunene. To the draining of these inland waters Schwartz (1) thought our ever-recurring droughts could be ascribed, as well as the general desiccation of the interior. The restoration of the lakes he claimed would not only be a safeguard against recurring droughts, but would actually increase the rainfall over the Union of South Africa. In brief, his proposals were to throw a weir across the Chobe and one across the Cunene, to fill the great lakes and create vast irrigable stretches in the Kalahari. Kanthack (2) and du Toit (3) after examining the proposals in situ, pointed out the weaknesses of the scheme and could not support it.

Apart from the natural drying up of a great swamp in an arid tropical region, which plant succession must inevitably bring about in course of time—a fact which appears generally to have been overlooked in the treatment of this subject—my cursory examination of the Taoge River, which has on occasions filled Lake Ngami, leaves little doubt in my own mind that the cause of the drying up of Lake Ngami can be ascribed, in part at least, to that which is a common factor throughout the length and breadth of South Africa, viz., man's destructive influence on the vegetation, and nowhere is this more patent than in the country traversed by the Taoge River before it reaches Lake Ngami. When it is remembered that this area has been occupied by man and large herds of stock for certainly more than a century and a half, this can hardly be wondered at, especially as we have all read how, only recently, deserts have been created in four decades in one of the most prosperous cattle countries in the civilised world, also under semi-arid conditions.

Partial preservation of some areas in the swamps is to be ascribed to the presence of Tsetse fly and malaria, making habitation impossible. I gathered from the white inhabitants and the natives that Tsetse fly is extending its range in Ngamiland, and a serious view of this is taken by both whites and natives.*

VEGETATION NOTES ON THE ROUTE.

The vegetation provides indisputable evidence that man has been the destructive agent in ruining the land and drying up the water supplies in this arid and highly vulnerable country. In the following vegetation notes on the route I have indicated the localities where this is unmistakable.

Martin's Drift on the Limpopo River to Palapye Road.

The stretch of country from Martin's Drift (fig. 1) to Palapye Road is mostly beautiful parkland vegetation with tall mopane trees and tall trees of *Acacia pallens* (fig. 2). Sometimes it is of the open woodland type, or more often than not it grades into that of the orchard type.

The valley of the Limpopo is typical thorn country in which *Acacias* dominate.

* Since this was written several cases of sleeping sickness in Europeans have occurred in the vicinity of Maun.

Palapye Road–Serowe.

Between Palapye Road and Serowe heavy red and yellow sands were encountered. These were covered with low thorn scrub in which *Acacias* dominated. Just before reaching the Serowe Hills the soil became harder and trees became more conspicuous and occurred in greater variety. *Acacias*, however, still dominated, but *Boscia* and *Sclerocarya* were conspicuous. It was in this type of veld that the large native lands were made (figs. 3 and 4). The immediate vicinity of Serowe—the headquarters of the Bamangwato—was bare of vegetation, trodden out, and thick with dust.

Serowe–Botletle River.

From Serowe to the Botletle River, a distance of approximately 150 miles through the Kalahari, we traversed three distinct types of vegetation. From Serowe to Inkowane Pan, a distance of 54 miles, heavy sand was encountered. This was covered with scattered trees, thorn bush, and tall grass (figs. 5 and 6).

From Inkowane Pan (fig. 7) to Detoie, a distance of some thirty miles, the country consisted of open, flat, grass plains with low scrub and was much more desertlike in appearance (fig. 8). The soils were sandy but harder than those previously passed through. After crossing a dry river bed there was a marked change in the soil. It was hard and calcareous. Tall palms could now be seen in the distance to the north-east. A cattle post had been established on this hard veld at the spot marked Detoie on the map, and here mopane bush and scrub were encountered (fig. 9). From here to Kokonane Pits and Lothlekane Well a hard limestone outcrop occurred and large plants of *Aloe rubro-lutea* and giant specimens of *Hoodia Lugardi* were growing in the bush (figs. 10 and 11). From Lothlekane Well (fig. 12) the country falls rapidly to the north and to the west and a big change in the vegetation takes place. The soils are hard, black or grey in colour. The country is covered with dense mopane bush (fig. 13) which extends to the edge of Chukutsa Pan (fig. 14). This pan was a white, glistening expanse covered with a dry saline deposit. Large *Commiphora* trees were growing on an island at the north-western end of the pan and considerable patches of *Cataphractes* bush were established beyond the margins (fig. 15).

Between Chukutsa Pan and Mopipi several large salt pans were passed, situated in mopane country. From Mopipi to Rakops the country is open parkland in the vicinity of the Botletle River (fig. 16), but away from the river it consists of open grassy plains. The soils are mostly dark coloured and mixed with much calcareous material. Dense fringing bush lined the river banks near Rakops (fig. 17).

Rakops–Maun.

After leaving Rakops the road traverses a fifteen mile stretch of flat open grassy plain (fig. 18) and then enters typical Kalahari sand veld (fig. 19). The road becomes heavy and the country is covered with dense bush and scrub (figs. 20, 21 and 22). At first the bush is composed of large thorn trees including *Acacia giraffae*, *Acacia rehmanniana* and *Acacia detinens*, also *Combretum* species, *Terminalia prunoides* and much *Grewia*, with rank grass including *Panicum*, *Chloris*, *Digitaria*, *Cenchrus*, *Enneapogon* and *Brachiaria*. This soon gives way to more open country covered with scrub in which thickets of *Acacia giraffae*, *Acacia detinens* and *Bauhinia macrantha* are conspicuous. The grass cover is made up of tall bunch-grasses belonging to *Digitaria*, *Eragrostis* and *Aristida*. This type of vegetation persists until the Botletle River is approached when the bush and scrub assume tree proportions.

At Samadupi Drift, where the Botletle was crossed, large trees of *Acacia litakunensis* line the banks and are overshadowed by riverine giants of *Combretum*, *Lonchocarpus*, etc. (figs. 23, 24 and 25).

A detour was made at the boundary fence between the Bamangwato and Batawana Reserves in order to visit Makalamabedi, a spot on the Botletle River which had once been occupied by natives (figs. 26 and 27). The river bed was dry, extensively tramped out, and a scattered growth of annual grasses, weeds, and young thorn bush gave little indication that water had passed down the bed in time past. Apart from the presence of the few thorn trees lining the banks and an occasional *Longchocarpus* the destruction that had been wrought by man and his stock at this spot was depressing. We were, however, shown a few waterholes in the bed of the river where water could still be obtained by lowering buckets. From Samadupi Drift to the Tamalakane River a belt of thorn bush and thorn trees, and then mopane forest on deep sand, was passed through (figs. 28 and 29). After this we emerged suddenly on to the bank of the Tamalakane about three miles south-west of Maun (fig. 30). A strong stream of crystal clear water was flowing down its broad channel to the south and was a most refreshing sight after the last few days that we had spent in the thirstland (fig. 31). The banks of this great stream were bordered with a fringing forest of giant trees and considerable undershrub. Abutting on the stream itself was a luscious growth of *Echinochloa pyramidalis*. The town of Maun was situated in open mopane woodland.

Maun–Lake Ngami.

Our route lay via Toten, Sehitwa Bodiben and from thence to Ghanzi. The distance from Maun to Toten is 50 miles. The road skirts the melapoes* of the dry Kunyene River practically the whole way to Toten. The banks of the Melapoes were thickly wooded with *Combretum imberbe* var. *Petersii*, *Acacia giraffae*, *Acacia litakunensis*, and the same trees that occurred on the banks of the Tamalakane at Maun (figs. 32 and 33). A luxurious growth of grass occurred in the shallow flood channels. Large patches of a tall *Cymbopogon* indicated localities which had evidently been used for crops at some previous date. A tall *Sorghum* (9–12 feet high) occupied low-lying hollows and robust *Digitarias*, *Panicums*, *Eragrostis* spp., and *Andropogons* completed the general grass mat. Away from the melapoes a more or less open parkland country was passed through in which groups of *Acacias* were conspicuous. In this type of country the grass cover was made up almost entirely of *Enneapogon* and *Eragrostis*. Much of this country between Maun and Toten had been abandoned on account of Tsetse Fly (fig. 34).

When we came to Toten a very different state of affairs met the eye. It had evidently been long deserted. Bare ground, trodden out soils, no perennial grasses, dwarf annual grasses, annual weeds, perennial weeds, dense thorn thickets, and dead giants of the past told their tale (fig. 35). A once flourishing population had moved on . . . A number of dry wells in the bed of the dried out river were also significant. This was Toten, the chief Batawana town established by Moremi I at the north-eastern end of Lake Ngami over a hundred years ago, and today the whole countryside around Toten is suffering from the treatment meted out to it in the past (*Figs. 36 and 37*).

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* "Melapo" is the local term applied to a spillway or shallow flood channel.

Lake Ngami.

The depression which bears this name was traversed along its northern margin from Toten to Sehitwa (fig. 38) and from the latter place it was crossed from its northern to its southern shore at practically its greatest width. Nowhere, either at its shores or across its main area, was any botanical evidence seen which would suggest that this area has within historic times been a permanent sheet of water. No trace of reeds was seen, although it is well known that a margin of reeds existed at the northern end as recently as 1910.

The periphery of the " lake " is covered largely by camel thorn forests and other *Acacias* (fig. 39) and there is a striking absence of Ngamiland fringing forest such as is seen elsewhere throughout Ngamiland in areas flooded in normal flood seasons and in areas flooded in heavy flood seasons. Great as has been the destruction of vegetation surrounding the " lake " it is hardly credible that had such fringing forest existed within fairly recent times all trace of it could have been so effectively removed by today. The absence of this fringing forest is one of the conspicuous features of this lake, the more so when this is so characteristic of nearby flooded areas. Much of the lake floor had been burnt over at the time of our visit. At the eastern end *Panicum repens* and a robust *Cynodon* were the dominant grasses and were being closely grazed by the large herds of stock (figs. 40, 41). From Sehitwa to Bodiben the same *Cynodon* and *Cenchrus ciliaris* were the dominant grasses. Apart from these the grass flora on the lake was remarkably uniform. In the richer soils along the margins, especially where overstocking had run apace, perennial grass had given way to an annual *Brachiaria*.

The invasion of the grass cover by young camel thorn throughout the lake area is more than patent and at the present rate of progression it will not be long before this whole area becomes a dense forest of camel thorn (figs. 42, 43 and 44). A number of antbear holes on the floor of the lake in different spots were examined. These, in nearly every case, revealed a deep substratum of calcareous soil.

The invasion of abandoned lands, of the surroundings of water holes, of trodden out areas and of over-grazed areas by dense growth of *Blumea gariepina* and other weeds leaves no doubt that the whole of this area has been sorely overtaxed for a considerable period (figs. 45–48).

Lake Ngami to Ghanzi.

On emerging from the thorn belt at the southern portion of the " lake " near Bodiben the country is open parkland in which *Acacia litakunensis* dominates (figs. 49 and 50). As Masarwanyane Pan is approached the vegetation becomes typical Kalahari thorn scrub in which *Acacia dulcis, Terminalia prunoides, Grewia cana, Cataphractes Alexandri, Combretum apiculatum* are the chief components (figs. 51 and 52). The grass cover was mainly *Aristida* and *Enneapogon*. This type of veld continues up to Gray's Pan, when more open grass country is encountered in which *Eragrostis* sp. dominates (fig. 53). At Dekar farm (fig. 54) lime-outcrop is seen, and thickets of *Acacia detinens* emphasize the danger which overstocking can bring about in this type of veld. The lime outcrop is even more pronounced at Ghanzi farm where thick bush forms the main feature of the vegetation. The bush was made up chiefly of *Acacia detinens, A. litakunensis* and *A. giraffae* in which large trees of *Combretum imberbe* var. *Petersii* were common. This lime belt was also suffering badly as a result of overstocking (figs. 55–58).

The Taoge River.

From Sehitwa a reconnaissance was made of the vegetation on the Taoge River, and it was hoped to examine the grass flora of its perennially flooded areas in particular, and the upper reaches of the Okovango also under perennial flood. Unfortunately we were prevented from doing this as we found the country from Gomare northwards under flood and were unable to proceed much further north than Gomare. The first flood water from the Taoge River was met with in the old river bed at Chukudu's Post seven miles north of Nokanen. Further north the flood water had not crossed the road until Gomare was passed (figs. 59–61). It is clear, therefore, that at the time of our visit the flood waters had reached Maun via the Ngoga River and its tributaries long before it had reached half the length of the Taoge River.

Sehitwa store (fig. 62) is situated on the edge of the belt of camel thorn forest on the northern edge of Lake Ngami about midway between Tololomoro and the old bed of the Maputle River. From here we followed the road which trends north-westwards to Tsau.

As soon as the camel thorn belt (figs. 63–65) was passed heavier sand was encountered with larger and older camel thorn trees. After this some striking country of ancient dunes covered with giant camel thorns and a dense growth of *Schmidtia* grass, through which the old channels of the Maputle River could clearly be seen, presented itself (figs. 66–68). North of this the country was more open parkland with scattered camel thorn trees (figs. 69–70). Beyond this, as the soil became harder and dark grey in colour, a marked change was noted in the vegetation. It now consisted of dense thickets of *Acacia detinens*, hundreds of dead camel thorn trees of all ages, and a profuse growth of perennial weeds, including *Blumea gariepina* (figs. 71–74). As we proceeded further north the country between Nakalechwe and Tsau became still more barren, desolate and uninviting (figs. 75–79). In fact, the whole country gave one the impression that it had been struck by some terrible catastrophe and devastated. Many would naturally put this down to drought, but few would admit that this drought was brought about through the influence of man, yet the proofs are there. This state of affairs continues right through to Tsau (figs. 80–82). Tsau itself was a veritable desert. Water could not even be obtained there, as all the wells and water holes were dried up, and we were told that water was brought from Sehitwa by lorry, a distance of 30 miles.

The road from Tsau to Gomare passes through a long stretch of country—some sixty miles—a portion of which is flooded in heavy flood seasons and a portion of which is an old flood area and has not, according to Stigand, been flooded since 1888. The road follows roughly the line of demarcation between these two areas.

The vegetation throughout this area leaves no doubt but that it must have been flooded over a very long period of time and that it has not yet suffered to the same extent as that to the south. The fringing forest in this area contained some of the finest and largest trees seen in Ngamiland (figs. 83–86). Apart from this, however, the whole area gave one the impression that it is rapidly becoming an impenetrable thorn thicket. Massive forests of camel thorn, dense thickets of *Acacia detinens*, and thick patches of *Acacia arabica* and *Dichrostachys nutans* tell their tale and leave no doubt that this area has been densely stocked with cattle for some time past and that these thickets are the result of previous occupation and that man-made drought is sure to follow (figs. 87–90). More and more the natives are pushing eastwards into the swamps,

destroying the vegetation, and inducing drier conditions. It is no wonder, therefore, that the Taoge River shrinks further and further north. For this reason it would be interesting to know what has actually taken place further north on the Taoge and especially on the upper reaches of the Okovango.

The Tamalakan River (figs. 91–100).

At the time of our visit (June 13–July 3), the Tamalakan River was in flood. Mealie lands which were visible in the river bed near Maun on our arrival on June 13th were completely out of sight and under water when we left on July 3rd.

The vegetation on both banks has been considerably interfered with by man, especially in the southern portion from Maun to its junction with the Botletle River. This portion, which is beyond the southern limit of the mopane, was originally covered by thorn forest in which *Acacia giraffae* and *Terminalia prunoides* probably played a prominent part. Today much of the timber has been removed and the country has been much tramped out. Dense thickets of *Dichrostachys* are steadily invading these parts. Some of the fringing forest is still left, but most of the large trees that could be used for the building of canoes, etc., have long since gone.

The general shallowness of the river is indicated by the growth of reeds and papyrus throughout its course. The longest reed swamps seen were at the junction with the Botletle and in the northern portion in the neighbourhood of the entry of the Gomoti and Mogogelo Rivers (figs. 101–104).

North of Maun the south bank of the Tamalakan is densely wooded with mopane on the sand belt. This belt, in spite of Tsetse Fly, is being invaded by native occupation and considerable sand drift must result (figs. 105 and 106).

The Gomoti River.

Having failed to reach the perennially flooded area of the Taoge River we made a reconnaissance of the perennially flooded area of the Gomoti River on our return to Maun and were just able to examine a portion of this before it was under flood. The characteristic feature of the Gomoti flooded area is the abundance of palm islands or palm stands in it (figs. 107–110). Sometimes these stands consist of palms only, but more frequently they contain in addition the trees which are commonly found in the fringing forest. The river itself was unlike those seen anywhere else in Ngamiland. The edges of the water and the banks were overgrown with a hydrophytic bush or tree—the Gomoti tree (*Ficus verruculosa*, Warb.) (figs. 111–117). The presence of this tree suggests that the plant succession in these swamps has been able to reach a much further stage than has occurred elsewhere, and points to the possibility that the Gomoti River must be of very considerable age. The higher ground abutting on the river was covered with a tall *Cymbopogon*, while over large areas of the lower lying ground *Imperata* dominated. On drier soils *Panicum repens* formed a dense growth (figs. 118 and 119).

Maun to Mababe Flats.

The road from Maun to the Mababe Flats as far as Joverega is part of the main road to Livingstone. The first thirty miles are through the melapoes of the Mogogelo River, These are skirted by the typical fringing forest found in Ngamiland, but in this stretch *Garcinia Livingstonei* is conspicuous. Many islands of palms also occur between the melapoes. Dense thickets of young camel thorn trees and of young trees of *Acacia litakunensis* were invading the open spaces between the melapoes and threaten to overrun much of this country .

On striking slightly eastwards the wooded mopane belt flanking the north-eastern portion of the Okovango delta was passed through, and after this a long stretch of very dense Kalahari thorn-scrub was encountered. This not infrequently was mixed with low mopane scrub. The thorn thickets were composed mainly of *Acacia dulcis*, *A. detinens*, *Bauhinia macrantha*, *Terminalia sericea* and several species of *Combretum*. The grasses were tall and coarse and consisted largely of species of *Digitaria*, *Eragrostis* and *Aristida* (figs. 120–122).

On turning westwards to the Mababe Flats the wooded mopane belt is again entered (figs. 123 and 124).

Mababe Flats.

The southern end of the Mababe Flats was crossed by following the road from Joverega to Shaleshanto. On emerging from the belt of mopane forests on the southern edge of the Flats open grass country is encountered in which *Cenchrus ciliaris* is the dominant grass (fig. 125). Apart from a belt of dense bush of *Acacia litakunensis* which protrudes into the grassland, the country becomes more and more open grassland towards the west (fig. 126). In the obviously lower-lying portion tall *Cymbopogons* and *Sorghums* are the dominating grasses (figs. 127, 128), but on the drier flats *Cenchrus ciliaris* dominates (fig. 129), with *Chloris gayana*, *Digitaria* spp., and a robust *Cynodon*. This open grass country, with some occasional tree and bush, extends to the west until it meets the Magwikwe sand ridge. No fringing forest was seen along the eastern or western edge of the Flats which would suggest that they, within historic time, have not been a permanent sheet of water. Only in the distance to the extreme south could fringing forest be seen in the neighbourhood of the Mababe River.

Mababe Flats to Kachikau.

From the southern end of the Mababe Flats the road to Livingstone passes along the eastern outskirts of the Flats to just beyond Tsotsoroga Pan where it turns westwards, skirts the northern edge of the Flats, passes round the Goha Hills to the west and finally bends eastwards and follows the ancient flood channel of the Linyanti to Kachikau. From Joverega at the south-eastern end of the Flats some thirty miles of woodland vegetation of mopane forests is passed through until Tsotsoroga Pan is reached (figs. 130–138). The soils are dark and a number of pans occur in this mopane woodland throughout the stretch. A few miles north of Tsotsoroga Pan heavy white sandy soils are encountered. On these mopane is replaced by tall bush composed of *Terminalia sericea*, *Albizzia* sp., *Acacia giraffae*, *Acacia hebeclada*, *A. rehmanniana*, *A. litakunensis*, *Combretum* spp., and *Burkea africana* (figs. 139–141). As the Goha Hills are approached this gives way to low dense Kalahari thorn scrub with which low mopane bush is mixed (figs. 142–144). North of the Goha Hills the sand belt abutting on the Linyanti swamps is covered with dense mopane forests and high forests of *Baikiaea*, *Berlinea* and *Brachystegia*. From here the ancient flood channel to Kachikau supports an open woodland vegetation of *Acacia spirocarpa*, *Lonchocarpus capassa*, *Trichilia emetica*, *Combretum imberbe* var. *Petersii*, *Adansonia digitata* and *Phoenix reclinata* (figs. 145–148) while the grass flora was made up of tall *Andropogons*, *Panicums*, *Digitarias*, *Chloris* and *Setaria* (figs. 149–151). The Goha Hills are well covered with tall trees forming an open deciduous woodland, in which Baobabs were conspicuous (figs. 152–155).

The Swamps of the Linyanti.

These were only seen in the neighbourhood of Kachikau (figs. 156, 157), and in the stretch of country from Kachikau to Kasane. From Kachikau a traverse was made in a north-westerly direction to Quegha where the Linyanti was reached. At first a wide stretch of open grassland country was passed over (figs. 158, 159). In this were occasional groups of *Phoenix reclinata* (fig. 160). Nearer the Linyanti, however, a few scattered islands containing Borassus palm and open woodland forest of *Baikiaea*, *Brachystegia*, *Kigelia*, and camel thorn were observed. On the heavier soils a tall *Cymbopogon* dominated the sward with much *Panicum repens* and *Andropogon eucomus* below (figs. 161, 162). Nearer the river on heavy white sandy soil a tall coarse *Aristida* was dominant, while the swamp land was covered by *Phragmites* as far as the eye could see (figs. 163, 164). Associated with the *Phragmites* were tall species of *Pennisetum*, *Setaria* and *Echinochloa* (figs. 165, 166).

From Kachikau to Kasane the chief characteristic of the swamp is the cover of reeds. The outstanding feature of both portions seen was the vast and almost uniform expanse of reeds. Islands of trees were not conspicuous in the southern portion under reeds, and this is worth recording, although wooded islands could be detected in the distant landscape to the north where the flood waters from the Zambesi are said to join those from the Linyanti. Typical fringing forest, however, occurs on the right bank from Kavimba to Kasane.

The plant succession in the Linyanti swamp would not appear to have reached the stage attained by much of the Okovango.

Kachikau–Victoria Falls.

From Kachikau to Kasungulu the road hugs the right bank of the Linyanti and skirts the edge of the wooded sand belt of the Kalahari which runs parallel with the river practically the whole way. The swamps along the route consist largely of *Phragmites*, *Typha*, *Cyperus Papyrus*, *Cyperus immensus* and a rank growth of *Echinochloa pyramiddalis* (fig. 167). Fringing forest is well developed and includes large trees of *Lonchocarpus capassa*, *Garcinia Livingstonei*, *Diospyros mespiliformis*, *Combretum imberbe* var. *Petersii*, *Acacia spirocarpa*, *Acacia pallens*, *Acacia albida*, *Trichilia emetica*, *Erythrophloeum africanum*, *Croton megalobotrys*, *Eugenia variensis*, *Berchemia discolor* and *Fockea* sp. (figs. 168–170).

The Kalahari sand belt abutting on the river carries a well developed open forest containing a great variety of fine trees. From Kasane we followed the road which runs south of the Zambesi to the Victoria Falls. From Kasane the red sand in the Protectorate was covered with open forests (figs. 171–172). From the Southern Rhodesia border the country becomes more open, and the road for nearly forty miles traverses along grassy vleis or melapoes bounded by sandy hills covered with open forest.

TYPES OF VEGETATION.

Briefly it may be stated that the vegetation encountered on the expedition consisted of the following types: Climatic, edaphic, physiographic and biotic. Of these the biotic and the hydrophytic (edaphic) types have the greatest interest so far as the purpose of this paper is concerned.

The main climatic type was Thorn Scrub which covers the greater part of the vast sandy Kalahari region. In this *Acacia* bush is the dominating feature, but a considerable variety of species occurs. Some are dominant over certain definite areas while others are almost exclusively confined to still different localities. The factors governing the distribution of these different *Acacias* still remain to be explored. Closely associated with the Acacia bush in this Thorn Scrub are dwarfed and stunted bushes of *Boscia*, *Bauhinia*, *Tarchonanthus* and *Balanites*.

Amongst the bush there is usually a scattered growth of tufted grasses. These belong principally to the genera *Digitaria*, *Eragrostis* and *Aristida*. This Thorn Scrub is characteristic of the region which receives a rainfall of 10–15 inches. Towards the east and north where the rainfall approaches 20 inches the Thorn Scrub takes on a more parkland character and in addition to the *Acacia* bush, which is always present, isolated trees of *Burkea*, *Terminalia*, *Combretum*, *Strychnos* and *Ochna* become the principal feature. In this type the grass cover is frequently rank and tall, but much the same genera occur. As the rainfal increases the open parkland character gives way to woodland vegetation with open canopy and a good ground cover of herbaceous shrubs and grass. In the north-eastern portion, towards the Victoria Falls, where the rainfall varies from 25–30 inches, a different type of woodland vegetation occurs. In this the trees are larger, better developed and of different types. They include *Afzelia*, *Baikiaea*, *Brachystegia*, *Pteerocarpus*, *Ricinodendron*, *Pseudocedrela* and *Amblygonocarpus*. The undergrowth is less developed and the grasses are smaller. There can be little doubt that these climatic types form part and parcel of the belts of vegetation which surround the great closed Forest of West Africa, and which occur in more or less modified composition in Angola, the Belgian Congo, Tanganyika, Kenya, Uganda, the Anglo-Egyptian Sudan and French West Africa.

The chief edaphic types were the fringing forests of the Botletle, of the Okovango delta system, and of the Chobe or Linyanti system ; also the swamp vegetation of the Okovango and Linyanti. Perhaps the most striking of these are the Acacia forests in the south-western portion of Ngamiland where the rainfall averages from 10 to 15 inches. Along the Botletle River and the Lake River, around the periphery of Ngami, and along the whole length of the Taoge River a grand development of camel thorn (*Acacia giraffae*) forest is to be seen. Other thorn forests which occur in large patches over this same area are those of *Acacia litakunensis*, of *Acacia karroo* and of *Acacia arabica*. On the heavy sandy soils abutting the north-western bank of the Taoge River a considerable forest development of *Terminalia sericea* has taken place.

Next in importance after the *Acacias* in this fringing forest is *Combretum imberbe* var. *Petersii*. This is one of the chief constituents of the fringing forests throughout the whole area and forms one of the most conspicuous features of the tree growths both lining the river banks and forming the wooded islands in the swamps.

The swamp vegetation of the Okovango and the Linyanti, as might be expected, has much in common with that of the swamps of Central and Northern Africa. This was seen in the submerged plants, in the floating plants, in the mudrooted sedges, reeds, and grasses collected as well as in the swamp bushes (*Sesbania* and *Aeschynomene*) and in the palms (*Hyphaene*).

One of the most interesting plants seen in the swamp vegetation of the Okovango system was the "Gomoti bush" (*Ficus verruculosa*) in the Gomoti River. These hydrophytic shrubs or trees were found to be occupying a habitat

which was more like a peat bog than anything else seen in these swamps. The ground was spongy and resilient and reverberated when jumped upon. Further, it smouldered and retained considerable heat long after fire had passed over it. The presence of these shrubs in the type of habitat mentioned where they form dense thickets can well be looked upon as the climax stage in the development of a tropical hydrosere, just as the alder or willow is looked upon as the climax stage in a temperate hydrosere. The presence of this type of vegetation together with the great deposit of humus or peat strongly suggests that the Gomoti River is one of considerable age, and possibly is the original channel of the Okovango before it broke up into its several branches. There can, however, be little doubt that the plant succession in the Okovango swamps has proceeded further here than was seen anywhere else.

A number of people have ascribed the blocking up of the river channels and the subsequent drying up of the rivers below to the presence of these Gomoti trees. While it is true that their presence must add considerably to the building up of the soil in their habitat it is difficult to understand how the actual trees can be said to block the passage of water.

The distribution of the Gomoti tree (*Ficus verruculosa*) is of considerable interest. It is found in swamp country in Northern Nigeria, in French Equatorial Africa, and extends through Ubangi-Shari to Uganda and East Africa and then southwards to Angola ; and now it is found as a conspicuous feature in the swamps of the Kalahari, thus forming another link between the vegetation of Tropical West Africa and Southern Africa. Finally it should be mentioned that the fringing forest of the Botletle and Okovango River system has much in common with that found on the Limpopo. The trees and shrubs found on these rivers all occur on the Limpopo and the abundance of *Croton megalobotrys* is certainly striking.

Little opportunity presented itself for a study of the physiographic types of the vegetation for the simple reason that few mountains or hills occur in Ngamiland, and it was only possible to pay a very hurried visit to the Mabeleapudi Hills at the south-western end of Lake Ngami and to the Goha Hills north of the Mababe Flats. The Mabeleapudi Hills rise about 500 feet above the open grass plain in which they are situated. The grass cover is mainly *Aristida* and *Enneapogon* and in this are isolated, stunted and scattered bushes of *Terminalia sericea*, *Terminalia prunoides*, *Combretum* sp., *Acacia dulcis* and *Grewia* sp. Flanking the hills the bush becomes much more pronounced, becomes much larger in size, and well developed trees of *Terminalia prunoides* are the chief feature. On the rocky hills *Croton Meynhartii* was the dominant shrub. Amongst this *Sclerocarya caffra*, *Combretum* spp., *Commiphora* spp., *Markhamia puberula* and *Terminalia prunoides* were noted. There was little grass in the hills, save a tall annual *Panicum*.

The Goha Hills lie in a sandy plateau slightly raised above the surrounding plain. The plateau is covered with low mopane scrub and the hills rise about 500 feet above this. At the foot of the hills mopane scrub is replaced by well developed mopane trees forming an open woodland belt. In this baobabs occur and from here they extend over and through the hills. On the hills tall deciduous trees of *Kirkia*, *Albizzia*, *Sclerocarya*, *Combretum*, *Pterocarpus* and *Pseudocedrela* formed an open canopy under which there was a considerable development of *Digitaria* and some tall *Andropogons*. The trees growth on these hills made a striking contrast to the surrounding mopane scrub, and provided a well marked instance of the effect of " local climates " on vegetation. This mopane vegetation can also be regarded as a southern outlier of one of the great climatic belts to the north.

The biotic types of vegetation encountered refer, of course, to those which spring up as a result of man's action and that of his grazing animals on the original veld. This modification may be brought about through burning, felling of timber, cultivation, general habitation and grazing and tramping by stock. They all tend towards the same result, viz. the exsiccation of the country. No where is this more rapidly brought about than in the semi-arid regions bordering on the tropics, where the daily evaporation is high, and the growing period is short. Throughout the expedition these biotic types were seen wherever it was possible for man and his beasts to eke out an existence. These types also furnish a valuable clue to man's past occupation of different parts of the country, and observations made during the trip leave very little doubt in my mind that there are very few, if any, parts of the country which were at all habitable that have not at some time been inhabited by man. Water, of course, is the limiting factor, and wherever there has been water there also have man and his stock established themselves. One outstanding result of this occupation has been the dimunition or total disappearance of the water supply, leading to a shift of occupation, or migration, elsewhere.

In the Thorn Scrub, apart from the towns of Palapye Road and Serowe, the chief centres of occupation had been the surroundings of Lake Dow and from here the entire length of the Botletle River westwards to its junction with the Tamalakan. The result was the same throughout, viz., the destruction of the perennial grass cover and its replacement by worthless annual grasses and weeds and an intense development of thorn scrub, so dense in many places as to render it impenetrable to man and beast. The same state of affairs was to be seen throughout the length of the Tamalakan River, but here, fortunately, a wise administration had evidently succeeded in saving some of the more beautiful trees composing the fringing forest in the vicinity of Maun. The conditions existing around Moremi's stad at Maun have been graphically described by Rey and have by no means been overpainted. In the mopane forest at Maun, where overstocking had occurred, mopane scrub frequently tended to take the place of thorn scrub which usually follows overstocking. From Maun to the junction of the Tamalakan and Botletle Rivers the country from the river bank backwards for some miles has been grazed out and tramped out, and is rapidly becoming a dense thorn thicket in which *Dichrostachys* plays a prominent part.

In the Lake River at Toten, which was perfectly dry at the time of my visit, no trace of reeds was seen. Around the periphery of Lake Ngami worn-out veld conditions existed. A feeble growth of annual *Aristidas* and prickly weeds of *Acanthaceae* and *Malvaceae* were all struggling to cover the bare patches between thickets of *Acacia* scrub. Under the camel thorn forests on the northern shores of the Lake, where the soil was lighter, richer and deeper, and where heavy tramping of stock had destroyed all the perennials, a dense growth of an annual *Urochloa* covered a wide area and had afforded a certain amount of good temporary grazing.

Covering the central portion of Lake Ngami, which is now a grass steppe, an interesting association of grasses was present. It consisted chiefly of *Cynodon*, *Cenchrus* and *Panicum*. The first two were dominant over large areas, while the *Panicum* was clearly fighting a losing battle. The *Panicum* was *Panicum repens* and was probably a relic of the grass flora when moister conditions prevailed on Ngami, but now under drier conditions and under pressure of heavy overstocking was being ousted by a tall and dense growing *Cynodon*. The *Cynodon* in turn was being replaced over considerable areas by *Cenchrus ciliaris*. Finally, in this overgrazed grassland wide belts and large irregular patches of young camel thorn (*Acacia giraffae*) were being established. To complete the

general picture, on the outskirts of the lake area, where cultivation had once been attempted, or where soil had been broken and pulverised by trampling stock a rank growth of *Blumea gariepina* ousted almost everything else.

North of Ngami, along the Mokolane River in the neighbourhood of Nakalechwe, the most arresting spectacle of blight-stricken country yet seen presented itself. In the distance the skyline was broken by naked and wizened tree-tops (*Combretum imberbe* var. *Petersii*) and below this another storey of wooden skeletons (*Acacia giraffae*) was intermixed with an occasional living tree, while the lower storey was composed of isolated thickets of *Acacia detinens*, *Acacia litakunensis* and *Acacia seyal* on stark, bare ground. From here northwards, along the Taoge River as far as Oabe, the furthest point we were able to reach on account of the encroaching flood water, heavily punished country was passed through. A narrow belt, north of Tsau, however, was conspicuous in that it had apparently escaped such treatment. This it was found, was infested with Tsetse, hence the preservation of the grass and much of the virgin bush.

A striking feature of the stretch of country along the Taoge River from Tsau northwards was the occurrence of dense thickets of *Acacia giraffae*, *Acacia detinens*, *Acacia litakunensis*, *Acacia seyal* and other species of *Acacia* and of *Dichrostachys* in all stages of development, from low bush to high forest, and it was clear that much of this could be attributed to the existence of cattle posts in this area some time in the past. Some of these biotic forests were evidently of considerable age and the ground cover of mixed annual grasses in which *Setaria verticillata* was often dominant, and the abundance of such plants as *Blumea gariepina*, *Achyranthes aspera* and *Chenopodium* spp., left little doubt as to the past history of these sites which obviously had been ancient cattle posts.

A very similar state of affairs as that just described was also seen at the southern end of the Mababe Flats, in the neighbourhood of what was known as the site of Shaleshanto's Village, and also along the Linyanti River from Kavimba to Kabulabula. At the former place high forests of *Acacia litakunensis* prevailed, while in the latter area impenetrable thickets of *Dichrostachys* were the outstanding feature.

Along the Taoge River I was told that the natives were more and more leaving the bush country on the western bank and pushing into the swamp country to the east. The prevalence of large fires in the swamp country left little doubt of its occupation, and a detour was made into this country from Nokanen eastwards. Much of this was found to be occupied by natives and their stock and their presence there was clearly converting swampland into grassland. but on the periphery of the wooded islands, where stock resorted for shade and shelter, the early stages of encroaching thorn thicket and thorn forest were clearly discernable, and left no delusions as to the future plant succession in these parts. The study of these biotic types of vegetation leaves little doubt that man and beast have not only occupied this area for a considerable time, but that they must have also had a marked influence on the exsiccation of the country. The latter is clearly seen locally wherever there has been any length of occupation. A brief review, therefore, of the historical records of Ngamiland may serve to emphasize the points alluded to.

HISTORICAL REVIEW OF NGAMILAND.

Ngamiland first attracted attention in 1850 when Livingstone ([4]) reported his discovery of the great inland lake in the interior of Africa. Both Livingstone's and Oswell's accounts of their travels, disclosing the abundance of elephant and other large game met with in this region, immediately drew traders, hunters,

explorers and naturalists to the scene, and Ngamiland became the chief centre of attraction in Southern Africa for a considerable time. Although there are numerous accounts of travel in these parts in the early days, these are devoted largely to a description of the hunting, the game, the animal and native life met with, while little of much value was placed on record of the vegetation and the natural features of the country.

To this, however, there are a few notable exceptions and from such of these as I have been able to consult I shall quote, where possible, the relevant passages.

Livingstone (4) was the first to give some account of the country which forms the southern portion of Ngamiland. In July, 1849, Oswell, Livingstone and Murray reached the Botletle River a few miles east of Lake Dow and then travelled along the bank of the river as far as Ngabisane, where they left all their wagons and oxen except Oswell's wagon, which was the smallest, and one team. From here Livingstone (5) travelled by canoe up what he describes as the " beautifully-wooded river " until he " came to a large stream flowing into it ". " This was the river Tamunak'le. I enquired whence it came." " Oh, from a country full of rivers—so many no one can tell their number—and full of large trees ! " " This was the first confirmation of statements I had heard from the Bakwains who had been with Sebitnane that the country beyond was not ' the large sandy plateau ' of the philosophers." " Twelve days after our departure from the wagons at Ngabisane we came to the north-east end of Lake Ngami ; and on the first day of August, 1849, we went down together to the broad part, and, for the first time, this fine-looking sheet of water was beheld by Europeans. The direction of the lake seemed to be NNE and SSW by compass. The southern portion is said to bend round to the west, and to receive the Teoughe from the north at its north-west extremity. We could detect no horizon where we stood looking SSW ; nor could we form any idea of the extent of the lake except from the reports of the inhabitants of the district ; and, as they professed to go round it in three days, allowing twenty-five miles a day would make it seventy-five, or less than seventy geographical miles in circumference. Other guesses have been made since as to its circumference, ranging between seventy and one hundred miles. It is shallow, for I subsequently saw a native punting his canoe over seven or eight miles of the north-east end ; it can never, therefore, be of much value as a commercial highway. In fact, during the months preceding the annual supply of water from the north, the lake is so shallow that it with difficulty cattle can approach the water through the boggy, reedy banks. These are low on all sides, but on the west there is a space devoid of trees, showing that the waters have retired thence at no very ancient date. This is another of the proofs of desiccation met with so abundantly throughout the whole country. A number of dead trees lie on this space, some of them embedded in the mud, right in the water. We were informed by the Bayetye, who live on the lake, that, when the annual inundation begins, not only trees of great size, but antelopes, as the springbuck and tsessebe (*Acronotus lunata*), are swept down by its rushing waters ; the trees are gradually driven by the winds to the opposite side, and become embedded in mud.

" The water of the lake is perfectly fresh when full, but brackish when low ; and that coming down the Tamunak'le we found to be so clear, cold and soft, the higher we ascended, that the idea of melting snow was suggested to our minds. We found this region, with regard to that from which we had come, to be clearly a hollow, the lowest point being Lake Kumadau ; the point of the ebullition of water, as shown by one of Newman's barometric thermometers,

was only between $207\frac{1}{2}°$ and 206°, giving an elevation of not much more than two thousand feet above the level of the sea. We had descended above two thousand feet in coming to it from Kolobeng. It is the southern and lowest part of the great river system beyond, in which large tracts of country are inundated annually by tropical rains, hereafter to be described. A little of that water, which in the countries farther north produces inundation, comes as far south as 20° 20′, the latitude of the upper end of the lake, and, instead of flooding the country, falls in the lake as into a reservoir. It begins to flow down the Embarrah, which divides into the rivers Tzō and Teoughe. The Tzō divides into the Tamunak'le and Mababe; the Tamunak'le discharges itself into the Zouga, and the Teoughe into the lake. The flow begins either in March or April, and the descending waters find the channels of all these rivers dried out, except in certain pools in their beds, which have long dry spaces between them. The lake itself is very low. The Zouga is but a prolongation of the Tamunak'le, and an arm of the lake reaches up to the point where the one ends and the other begins. This last is narrow and shallow, while the Zouga is broad and deep. The narrow arm of the lake, which on the map looks like a continuation of the Zouga, has never been observed to flow either way. It is as stagnant as the Lake itself."

"The Teoughe and Tamunak'le, being essentially the same river, and receiving their supplies from the same source (the Embarrah or Varra), can never outrun each other. If either could or if the Teoughe could fill the lake—a thing which has never happened in modern times—then this little arm would prove convenient escapement to prevent inundation. If the lake ever becomes lower than the bed of the Zouga, a little of the water of the Tamunak'le might flow into it instead of down the Zouga; we should then have the phenomenon of a river flowing two ways, but this has never been observed to take place here, and it is doubtful if it ever can occur in this locality. The Zouga is broad and deep when it leaves the Tamunak'le, but becomes gradually narrower as you descend about two hundred miles; there it flows into Kumadau, a small lake about three or four miles broad and twelve long. The water, which higher up begins to flow in April, does not make much progress in filling this lake till the end of June. In September the rivers cease to flow. When the supply has been more than usually abundant, a little water flows beyond Kumadau, in the bed first seen by us on the fourth of July; if the quanity were larger, it might go further in the dry rocky bed of the Zouga, since seen further to the east. The water supply of this part of the river system, as will be more fully explained later on, takes place in channels prepared for a much more copious flow. It resembles a deserted Eastern garden, where all the embankments and canals for irrigation can be traced, but where the main dam and sluices having been allowed to get out of repair, only a small portion can be laid under water. In the case of the Zouga the channel is perfect, but water enough to fill the whole channel never comes down; and before it finds its way much beyond Kumadau, the upper supply ceases to run, and the rest becomes evaporated. The higher parts of its bed even are much broader and more capacious than the lower towards Kumadau. The water is not absorbed so much as lost in filling up an empty channel, from which it is to be removed by air and sun. There is, I am convinced, no such thing in the country as a river running into sand and becoming lost. This phenomenon, so convenient for geographers, haunted my fancy for years; but I have failed in discovering anything except a most insignificant approach to it."

Livingstone gives a brief description of the trees and animals found in these parts, and his account of the game and the "prodigious numbers" of elephants, brought immediately a host of hunters into this area. Of the trees

he says: "The trees which adorn the banks are magnificent. Two enormous baobabs (*Adansonia digitata*) or mowanas, grow near its confluence with the lake where we took the observations for the latitude (20° 20′ S.). We were unable to ascertain the longitude of the lake, as our watches were useless; it may be between 22° and 23° E. The largest of the two baobabs was 76 feet in girth. The palmyra appears here and there among trees not met with in the south. The mokuchong or moshoma bears an edible fruit of indifferent quality, but the tree itself would be a fine specimen of arboreal beauty in any part of the world. The trunk is often converted into canoes. The motsouri, which bears a pink plum containing a pleasant acid juice, resembles an orange tree in its dark evergreen foliage and a cypress in its form. It was now winter time and we saw nothing of the flora."

Livingstone's ([4]) first account of the lake was read on February 11th, 1850, at the Royal Geographical Society's meeting and was communicated by the London Missionary Society and by Captain Thomas Steele of the Coldstream Guards.

A sketch was given of the route traversed and a good description of the country encountered.

He states that he left four of his wagons at Ngabisane, about 90 miles from the point where he struck the Zouga or Botletle River, and then went on to the lake with one of Oswell's wagons. Oswell's ([6]) account of the expedition was read before the Royal Geographical Society on April 8th, 1850. He says they left their wagons 96 miles from where they first struck the Zouga River, and it then took them 12 hard days to arrive at the town of the Batonani at the eastern end of the lake. From here they rode on six miles and then got a beautiful view of the lake. He says to all appearances it was boundless as the ocean (July 16th). Oswell says that two to three days from the lake the Zouga is broad, varying from 200–250 yards with flat and rather swampy shores. It then narrows and flows through high banks of limestone for six days, again opens out, and at its most southern point spreads into a little lake four miles or so across. It then divides into two streams, one of which loses itself in the salt pans to the east.

The President of the Royal Geographical Society, in referring to Oswell's paper, mentioned Francis Galton's projected trip to Lake Ngami and stated that Galton had left for the Cape in April, 1850. Galton ([7]) attempted to reach the lake in 1851 from Walfish Bay but did not get nearer to Ngami than the banks of the dried up water-course of the Buitsivango some 200 miles away.

In the meantime the lake had been visited in 1849 by Edwards, son of a London missionary, but there is no account of his route.

In July, 1851, the lake was visited by Leyland ([8]) the naturalist, with Edwards, Ryder the artist, and a party of English officers. They travelled the same route as Livingstone and reached the lake on July 13th, 1851. Ryder contracted fever at the lake and died there. Leyland adds little to Livingstone's account of the lake. He says "the Batawani town near the lake stands about a mile inland from where the Zouga begins to widen. A few miles further up, the opposite shore becomes invisible, and an unbroken expanse of water presents itself to the eye." "Trees of great magnitude grow in the vicinity of the Zouga river near the lake. A short distance from the town there were several moorwanah trees, exceeding seventy feet in circumference. Another tree, called the Mochocong, bears fruit fourteen inches long and three or four inches in diameter. The palmyra tree is also found scattered on the banks of the river. The principal tribe located on the Zouga is the

Bakoba or slaves they appear to be, a finer race of men, and more muscular than the Bechuana kaffirs." He states that when he passed the junction of the Tamunakle river with the Zouga, the river was beginning to fill.

Andersson (9) who had failed with Galton to reach Lake Ngami in 1851, from Walfish Bay, successfully achieved his object two years later, and arrived at Ngami in July, 1853, after traversing the western route, again from Walfish Bay. Speaking of the country between the old river bed of the Buitsivango (Ghanzi) and Ngami, it is interesting to note that Andersson says: "Notwithstanding the wooded character of the country, it affords excellent pasturage; and the numerous old wells and pits found between Tunobis and the Ngami, clearly indicate that these regions have, at no very remote period, been largely resorted to by some pastoral people."

On his map of this area Andersson has inserted the following: "Sandy soil, on limestone foundation, thickly wooded, with fine pasturages, but with little or no water."

Andersson's account of the lake is: "After feasting my eyes for a while on the interesting scene before me, we descended from the higher ground towards the lake, which we reached in about an hour and a half. But, though we breathed a fresher atmosphere, no perfumed or balmy scents, as might have been anticipated on the borders of a tropical lake were wafted on the breeze.

"Whether my expectations had been raised to too high a pitch, or that the grandeur of this inland sea, and the luxuriance of the surrounding vegetation had been somewhat exaggerated by travellers, I must confess that, on a closer inspection, I felt rather disappointed. In saying this I must admit having visited it at a season of the year little favourable to the display of its grandeur. But, if I am not mistaken, its discoverers, Messrs. Oswell, Livingstone and Murray saw it under no more auspicious circumstances. The eastern extremity, however, the only portion ever seen by the gentlemen in question, certainly possesses superior attractions to the western, or where I first struck upon the Ngami.

"The lake was now very low, and the point first seen by us exceedingly shallow. The water, which had a very bitter and disagreeable taste, was only approachable in a few places, partly on account of the mud, and partly because of the thick coating of reeds and rushes that lined the shore, and which were a favourite resort of a great variety of waterfowl. Many species new to us were amongst them; but we had no time to spare for approaching the birds.

"We twice bivouacked on the south border of Ngami before coming in sight of Lecholetébe's residence, situated on the north bank of the river Zouga, and at a short distance from where its waters separate themselves from the lake.

"The northern shore of Ngami is low and sandy, without a tree or bush, or any other kind of vegetation within half-a-mile, and more commonly a mile. Beyond this distance (almost all round the lake), the country is very thickly wooded with various sorts of acacia indigenous to Southern Africa, the damara 'parent tree', a few species of wild fruit trees, and here and there an occasional baobab, which raises its enormous head high above the highest giant of the forest. The southern coast of the lake is considerably elevated, and the water is so closely fringed by extensive belts of reeds and rushes that it is only accessible in a few places, or where the native cattle have broken through these natural defences. The west shore of the lake is also somewhat raised, though the water is very shallow; but it deepens considerably towards its eastern extremity.

"The Ngami must have undergone very considerable changes at different periods. The natives have frequently pointed out to me places, now covered with vegetation, where they used to spear the hippopotamus. Again, there are unmistakeable proofs of it having been at one time of smaller dimension than at present; for submerged stumps of trees are constantly met with. This is not, I believe, to be attributed to the upheaving, or to the sinking of the land, but that in all probability, the lake was originally of its present size, or nearly so, when a sudden and unusually large flood poured into it from the interior, which, on account of the flatness of the country, could not be drained off as quickly as it flowed in, but caused the water to rise above its usual height, which, remaining in that state some time, soon destroyed the vegetation.

"The lake is fed by the Teoge at its north-west extremity. The river never, perhaps, much exceeds forty yards; but it is deep, and when at its greatest height contains a large volume of water. Its annual overflow takes place in June, July and August, and sometimes even later. The source of the Teoge is as yet unknown, but it is supposed to be very distant. It may probably have its rise in the same high table-land as the Quawya, and other streams of importance. The main course of the Teoge is NW, but it is so serpentine that, in thirteen days when I ascended it, travelling on an average five miles per day, and reckoning two and a quarter miles to the hour, I only made about one degree of latitude due north of the lake. As far as I proceeded, however, it was navigable with smaller craft: for only in three places that I can remember, did I find less than five feet of water, and generally speaking, the depth was considerable. It must be recollected, however, that it was then at its greatest height.

"Though that portion of the Teoge ascended by me is narrow, I am told that, on approaching its source, it widens considerably (one of the many curious points in African geography); and the country on both sides is often inundated to a very great extent, frequently having the appearance of an endless lake, thickly overgrown with reeds and rushes, and dotted with islets covered with beautiful trees and shrubs.

"At its eastern extremity the Ngami finds an outlet (the only one) in the fine and stately Zouga. This river, near the Batoana-town, where it escapes from the lake, is about two hundred yards wide, and, from its gentle flow, appears at rest, the motion of the stream being imperceptible to the eye.

"The Bechuanas, who inhabit the shores of the Ngami, are rich in sheep and goats, but possess comparatively few horned cattle. Like other tribes of that nation, they are excessively fond of their oxen, but more particularly prize their cows, which scarcely anything can induce them to part with. Indeed, they will readily give ivory, when plentiful, in exchange for cows."

After exploring Ngami Andersson's aim was now to proceed to Libèbébto collect information in regard to the tributaries to Ngami. So, from Lecholètébe's town at the north-eastern end of the lake, Andersson traversed the northern shore by canoe to the western extremity of the lake, where he reached the chief entrance of the mouth of the Teoge, where there was a bar. "The water was so low on it that although the stream was fast rising at the time (August), we were forced to draw the canoes across it by main force. It is true we might have avoided the inconvenience by proceeding a mile or two to the westward, where a channel exists that is said to be navigable at all seasons.

"After passing the bar at the mount of the Teoge, the depth of water increased, and the current flowed with less velocity—from two to three miles per hour, I should say. For the first few days' journey, the country presented

rather a dreary and monotonous appearance, being frequently flooded for many miles; thus converting the land on both sides into extensive reedy marshes, only occasionally relieved by a pleasant group of the date and the fan-palm. The banks were in many places so low that when bivouacking on shore, we often slept in the water. Even where the banks rose a few feet above the surface, they were entirely undermined by the stream; and if a stick was thrust through, water immediately appeared in the hole. Fuel was exceedingly scarce, and could only be purchased from the natives (thinly scattered along its banks) who not infrequently brought it from a very great distance.

"On the fourth day, the landscape assumed a more pleasing aspect; the banks of the river became higher, and were richly covered with a rank vegetation. There was the fan-palm, the date, the black-stemmed mimosa, the wild and wide-spreading sycamore, the elegant and dark foliaged moshoma, and a variety of other beautiful, often to me new, trees, many yielding an abundance of palatable and nourishing fruit. Timbo, who accompanied me, recognised no less than six or seven kinds of fruit trees, indigenous to the east coast of Africa, and the adjacent countries. The arboreal scenery, indeed, in some places exceeded in beauty anything that I have ever seen."

Along the Teoge Andersson encountered for the first time the tsetse fly, and he states that the banks of Teoge were inhabited by the Bayete (Makova) and Bushmen. He also points out that in former times the Bayete possessed numerous herds of cattle, but that these passed into the hands of the Bechuanas.

Andersson states that he proceeded up the Teoge river about 70 miles north of Ngami.

Following close on Andersson's visit to Ngami was that of Chapman ([10]) the explorer and traveller.

Chapman first visited Ngami in November, 1853. He came from the Chobe via the Mababe flats, travelled down the Tamalakane river, and then cut across to Makato's town on the Botletle river. From here Chapman visited the lake on a pack-ox and spent only one day there. Of the lake he says: "In the evening I travelled up the margin of the lake, outside of the dense growth of reeds and rushes which here skirt the bank, and running out into the water for a mile or two, effectually conceal its broad expanse of water from view. Round the lake is a belt of plain covered with a short prickly grass, which generally grows on soil emitting a saline efflorescence. This plain was formerly covered with water, but during the last twenty years the waters of the lake have receded very much, generally for two or three miles all round; many of the people, or rather most of them, remember the time that they used to navigate their canoes amongst the dark evergreens that skirt its shores.

"Turning westward, the opposite shore was not visible, the length of the lake, which ranges from north-east to south-east, being at least 50 miles; the width does not appear to exceed 10 or 12 miles. The depth I have since had an opportunity of testing, and found it not to be more than about twelve feet in the deepest part: but the water for the most part is so shallow that the average depth may not be more than six feet. Even now the lake is fuller some years than others; old Magalakoè remembers the time when the waves were so high as to throw the hippopotami on shore, and describes them as roaring like thunder. A few of those animals are still found in the lake, which abounds with many kinds of edible fish, and is infested with crocodiles. A great many canoes are out in the lake every day employed in fishing, but generally keeping close to the bank, for fear of the wind springing up, which

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would certainly sink most of these boats, as they rise only a few inches above the surface of the water, and some of them not more than an inch. The reeds and marshes teem with waterfowl that hide therein, but are generally very clamorous."

" Lechulatébè's Town stands in an angle between a bend of the lake and the Botletle river. It contains about 400 huts, with the usual khotla in the middle, near the chief's residence."

Chapman was again at Ngami in July, 1854, this time travelling along the Botletle river from Lake Dow to its junction with the Tamalakan. He spent very little time at the lake as he was suffering from fever and says nothing of interest about this visit.

In May 1855, Chapman was at the lake for the third time, approaching it from the east, from the Botletle river. On the 31st May he reached Lechulatébè's town from the junction of the Tamalakan and the Botletle and was surprised to find that the tribe had removed to the north side of the lake, above the junction of the Teoge river.

Chapman visited the lake again in November, 1856, and found Lechulatèbé much concerned about the epidemic, malaria, which was causing havoc amongst his people. Chapman speaks feelingly of the plague of mosquitoes which he encountered at the lake at this time.

Chapman was at the lake again in December, 1861, and approached it this time from the west coast. On this occasion he says : " I have never seen the lake so dry before. The boatmen could not find a landing owing to the mud, and had to land 10 miles off. Our cattle had great difficulty in getting a drink the first day. Fortunately the rain has since fallen, or we would have had to send back. The Damaras now got plenty of plums (morotonogoè) and motlope berries to eat.

" The south banks of the lake are thickly studded with the 'wait-a-bit' (real) camel-thorn, another thorn with large upright pods, mochnerie, motseara, and motlope, plums and other trees. The 'wait-a-bit' is in full bloom, but the leaves are all riddled by the number of bees and insects piercing and devouring them, and making a constant buzzing."

Chapman visited the lake for the sixth time in May, 1862, and on this occasion he journeyed down from Daka in the north-east. His remarks on this visit are of interest. He says: " I have referred elsewhere to the mistake under which both Livingstone and Andersson laboured in supposing the Botletle to be an outlet of the Ngami lake. About thirty years ago, or more, this was indeed the case when the lake extended over, perhaps, nearly twice the area it occupies now. Ever since that time it has had two confluences, but no outlet. The waters of the Dzo, dividing, help to supply the lake, but send the largest quantity of water eastward through Chapo's lagoon, or reed marsh (the size of which has been under-estimated), into the large Salt Lake.

" When the Botletle river is very low, the whole of the water coming from the Dzo into the Tamalukan and Botletle first flows westward for some distance, until it has filled up for a certain distance the deep channel leading lakewards, and not until this is filled up will it have scope to run freely to the eastward ; the residue then going westward into the lake. Neither the river nor the lake now ever attains its former fullness. The position of the large mochnerie trees on its banks will point out the original water-mark. These trees always grow on the water's edge, and, now that the river is receding so far, many die off every year."

F. Green ([11]) the hunter who had been at the lake in 1852, was back there again in May, 1855, with Wahlberg the Swedish naturalist. Green's account of this visit, and his journey up the Teoge river are contained in a series of articles published in the Eastern Province Monthly Magazine from 1856–1858.

On reaching the shores of Lake Ngami in May, 1855, Green remarked to his companion Wahlberg that the lake had considerably decreased in size since his visit in the year 1852, and he states that he even then was much struck with the observations of one of its discoverers, which seemed likely to come to pass: "Those who had a desire to visit the lake had better be quick about it, otherwise they would arrive to see a dry one."

Green mentioned that he found that the Batawana had removed from their former place of residence and had erected another town at the western extremity of the lake near the Tonka river. Green would appear to have penetrated as far north-west as the Popa Falls, and throughout his journey up the Teoge river the country even at that date was thickly populated by natives.

Thomas Baines ([12]) the artist, accompanied Chapman to the lake in December, 1861, and his impression of Ngami is as follows: "The bit of water in sight was a mere strip, and the horizon was bounded by reedy islands less than three-quarters of a mile distant."

Baines visited Ngami again in May, 1863, and from the sand bult at the south-western end of the lake he describes the scene as follows: "From the hill of red sandy soil north of the tree it is possible in the daylight to see the waters of the lake.

"Next morning we walked on early and in half-an-hour saw the lowland of Ngami, with the reeds marking the former extent of the waters, which had now receded so far that, as the Bechuanas said, the usual outspan on the shore was not damp enough to breed a mosquito."

Schinz ([13]), the Swiss botanist, in 1886 attempted to visit Lake Ngami, approaching it from Grootfontein in South West Africa. The nearest point to the lake which Schinz reached was Tsau, where he found the Chief Moremi residing, and he states there were about a hundred large make-shift huts. Schinz failed to secure Moremi's permission to visit the lake and he was compelled to return to South West Africa without ever seeing the lake. Schinz gives a meagre account of the vegetation encountered on his journey and adds little to the knowledge of the general vegetation in these parts.

Passarge ([14]) spent two years in Ngamiland from 1896–1898, surveying the country on behalf of the British West Charterland Company, Limited. He entered the Bechuanaland Protectorate at Palapye Road and travelled via Rakopsito the Botletle and the Lake River to Toten. From here he examined the country south and south-west of Lake Ngami and then explored the western edge of the Okovango delta, and the country west of this, proceeding as far north as Andara.

Passarge gave a voluminous account of the Kalahari, chiefly from a geological point of view, and he certainly contributed much to our general knowledge of the country. He drew attention to the fact that the natives made use of the alluvial soils of the Botletle river during the rainy season for growing maize, millet, beans and melons, and that this humus-like soil was of an extremely dusty nature. Passarge sub-divided the flora of the central Kalahari into a number of groups, but as several of his statements regarding certain trees in the Okovango delta are not in accord with my own observations, I feel that

his statements regarding the vegetation must be accepted with caution. Further, when he states that there is not a single tree of the fringing forest of the Okovango and Botletle which is common to the Limpopo river one cannot help doubting his botanical observations in general.

Passarge published as a supplement to "Die Kalahari" a valuable series of maps and charts. From these it is clear that the native occupation of the Okovango delta and its river systems was confined almost entirely to the Botletle river, the Ngami river, the Tamalakane river, the southern shores of Lake Ngami, the entire western fringe of the Teoge river, and the Okovango just above the area where it splits into the main branches of its delta. Passarge's great work was published in 1904. I am indebted to Dr. A. W. Rogers for pointing out to me that Passarge in his great work on this region makes no mention whatever of the overstocking of the Kalahari.

Gibbons ([15]) in 1899 travelled down the Kwito river to its junction with the Okovango and then explored its northern bank as far south as Kangara. From here Gibbons proceeded to the Linyanti swamps via the Makwegana spillway. Gibbons records that this portion of the country was thickly populated by the Mampukushu who had large fields of corn and much stock.

Major E. J. Lugard ([16]) in 1909 was the first to give us a comprehensive picture of Ngamiland. His account of Ngamiland appeared as an introduction to a paper on "The Flora of Ngamiland" published in the Kew Bulletin No. 3 of 1909. The material, which formed the basis of the botanical paper by N. E. Brown was collected by Major Lugard and his brother (then Sir F. Lugard) in 1896, and by Major Lugard and his wife in 1897–8 in Ngamiland and the northern part of the Kalahari desert, chiefly in the neighbourhood of the Kwebe Hills and along the Botletle and Lake rivers. Lugard describes the physical features and the general characteristics of Ngamiland. Referring to Lake Ngami, Lugard points out "that Lake Ngami has ceased to be a lake, and is now practically dry. It has become a vast expanse of reeds growing on a treacherous bottom, impassable to man or beast. It is true that, in years of exceptional rainfall in the countries to the north, the depression still fills up for a few months with the water brought down by the Okovango and Tamalakan rivers. This occurred in 1899, when I last saw the lake, but I am told the water gradually disappeared, and the lake has not filled again. Water may at any time be found in the lake bed at a depth of some 20 feet, but it is brackish and unpalatable."

At this time the Batawana under the Chief Mathibi were living at Tsau, some 30 miles north-west of the lake, on one of the channels of the Okovango or Teoge river, and Lugard estimates that they did not exceed in all more than 1,500 persons.

Lugard makes several interesting and important observations on the Batawana and their stock and says: "The Batawana, like all the Bechuana tribes, were owners of vast herds of long-horned cattle, until the rinderpest in 1896 caused such terrible devastation. However, I am informed there has been no recrudescence of rinderpest or other cattle disease, except a small outbreak of 'lungsickness' amongst imported cattle, which was stamped out by stringent measures, and herds of considerable size are reappearing in the land. They also have large herds of goats and fat-tailed sheep, the latter so admirably provided by nature with the means of facing the stress of 'lean months'. The Batawana possess a few horses, but unless 'salted' (i.e., recovered from horse-sickness) imported horses seldom survive. The tsetse fly (*Glossina morsitans*), fatal to all domestic animals, was formerly troublesome in parts of the

river area, but since the extinction of the wild buffalo in these parts by the rinderpest in 1896, it has now completely disappeared."

An interesting general account of the flora and fauna of Ngamiland is given, but more especially of the flora in the neighbourhood of the Kwebe hills. Some very significant observations relating to the water supplies of this locality must be quoted. Lugard says: "The kopjes are very rough and boulder-strewn, but the sand of the surrounding desert has penetrated into the group in the intersecting valleys. The range, which was formerly well supplied with springs, is now devoid of water save for two water-pits; these are situated in the centre of the hills in a shale and limestone formation, and still yield a fair supply. Formerly these hills were the headquarters of the Batawana, but with the drying-up of the wells they were forced to migrate with their herds of cattle to the river area."

This is again another instance of the old story—native occupation and subsequent exsiccation of the country.

In his concluding remarks on Ngamiland, Lugard expresses the opinion that Ngamiland "can never be a white man's country". In support of this he quotes the failure of the Boer settlement at Ghanzi, and points out that the remnants only "eke out a precarious existence by 'transport riding'".

Lugard goes on to say: "There are those, however, who hold that accumulated subterranean supplies of water exist in the desert, which, if tapped, would convert the land into one of the most fertile regions. Some hold that the solution of the problem lies in artesian wells, and that the Kalahari desert may yet support stock-farming on a very large scale. The opening up of waters must rest with the Government, who alone could face the cost of such an undertaking, which must always be most uncertain in results." "The possibilities of the Kalahari as a future stock-raising country depend entirely on success in opening up water supplies. But as regards the river area and adjacent country, there are possibilities for irrigation on a large scale. In this connection I quote the last official report on the Bechuanaland Protectorate: "Irrigation at present is unknown, and, so far as can be seen, will never be possible on a large scale except in that remote portion of the territory known as Ngamiland. There, a great river, the Okovango, flowing from the north, enters the Protectorate and gradually loses itself in marshes of vast extent. The annual volume of water which the Okovango carries is enormous, and today this element, so precious in South Africa, disappears in the middle of the sub-continent as completely as though it were discharged into the ocean. It is not too much to suppose that in the days to come the flow of the Okovango will be controlled, and that by a system of canals that region, today a desolate swamp, and many hundreds of square miles bordering upon it, may become land capable of the highest cultivation. Some day Ngamiland may be known as the Egypt of the South."

Thus Lugard comes to the common and usual conclusion that the possibilities of the Kalahari as a stock-raising country depend entirely on the success which is attained in opening up water-supplies. This view, unfortunately, is based on insufficient knowledge of the country as a grazing proposition. The views referred to above on the irrigation possibilities of the Okovango delta should also be accepted with considerable caution. N. E. Brown ([17]) completes Lugard's paper by giving a classified list of the plants collected by the Lugards in Ngamiland. This collection contained a total of 374 species of which 92 were new.

Selous ([18]) in 1909 in the "Journal of the African Society" says: "In the early fifties of the last century, too, when C. J. Andersson, Fred Green and several other travellers first visited Lake N'gami, they found both buffaloes and the tsetse fly very numerous on the banks of the Okovango immediately north of the lake. As soon, however, as the Batauwana began to obtain firearms, they rapidly drove the buffaloes northwards, the fly went with them. Today the Batauwana live a long way up the once fly-infested Okovango, and are in possession of great numbers of cattle, sheep and goats."

Franz Seiner ([19]) during December, 1906, and January, 1907, crossed the Central Kalahari from Palapye Road via Serowe through Ngamiland to Windhoek. Seiner adopted Passarge's division of the Central Kalahari into some ten different types of veld, and gave a list of the plants characteristic of these areas, based largely on Passarge's collection and those of previous travellers. As much of Seiner's travelling was done by night his account of the country travelled over does not add much to that of Passarge.

In dealing with the Ngami swamp he states that the excellent fodder grass (*Cenchrus ciliaris* (L.) covers large plains, while on the other hand the equally nourishing *Cynodon dactylon* is only found sporadically.

Dealing with the Okovango delta Seiner points out that very little is yet known about the grass vegetation of the swamp country, and in discussing Lake Ngami he says the lake can already be regarded as a steppe country. Although Passarge reported that an area of 650 square kilometers of Ngami was still covered by *Phragmites*, Siener says the alluvial flats adjoining this to the north and west are transformed into grass steppes surrounded by dense bush. Seiner ascribes this conversion of swamp country into steppe country to the natives burning the vegetation with the object of cultivating the soil.

Streitwolf ([20]) visited the Caprivi Strip and the Okovango delta in 1909, and he has given a vivid picture and a very realistic account of Ngamiland. He states that Ngami was last filled in 1895, that the flood water of the Teoge has ever been receding and that at the time of his visit it was drying up in the sand just below Tsau. He put the drying up of Ngami down to the diminution in the volume of water from the Okovango and also to the silting up of the bed of the river itself. Streitwolf points out that Passarge was of opinion that the blocking up of the main channels of the Okovango was largely due to abandoned papyrus rafts being left by the natives near the entrance of these channels, and he agrees largely with this view.

Streitwolf makes one very important observation on the Teoge river which should be repeated here. He says that after the Teoge river was cut off from Lake Ngami it spread out to the east and filled a huge swamp area: in other words created a new Ngami north of the old one.

Stigand ([21]) in 1912, gave a brief description of Ngamiland and its natives. In this he pointed out that the Batawana lived at the eastern end of Lake Ngami at Toteng from 1800 till 1886, when they moved to Nokanen, after the second Matabele raid. After moving several times again he says they finally settled at Tsau.

Speaking of Lake Ngami Stigand stated that when in July-August, 1910, he "emerged from the Moshu and Muka scrub into the sandy flat bordering Ngami, nothing was to be seen but a sea of reeds, with the Mabele-a-pudi and Kwebe hills beyond."

Stigand [22] in 1913 describes a traverse which he made in Ngamiland during January-March, 1911, from Tsau to the Chobe river and from Toten to the Mababe by water. Stigand says the country " is also interesting because of Lake Ngami itself, which today has almost entirely dried up with the exception of a little water that flows into its eastern end during the flood season, and is a vast reed bed which itself has been gradually contracting its borders during the last decade owing to this desiccation." Stigend says that " the bulk of the Okovango water is carried down in the easternmost rivers, and today no water reaches Lake N'gami by the extreme western ones." Stigand puts the failure of the water to reach Lake Ngami down to the diversion of the channels to the north through silting up, but also to the greatly decreased volume of the Okovango.

He states that the Teoge ceased running into the lake about the end of the seventies and that when Moremi succeeded his father Letsholathèbé about 1880, the Teoge had completely dried up south of the Mokolane. He adds: " The only water that reaches the lake today flows into it at its eastern end, and then only when the Kunyene and Thamalakane rivers are in high flood. When the Kunyene and Thamalakane rivers are both very full, the whole of the Kunyene water and a portion of the Thamalakane water run into the lake. The Thamalakane, which is the largest of all the branch rivers, when very full, divides its water at its junction with the Botletli and Lake river, the larger portion thereof flowing eastwards down the Botletli and the smaller portion along the Lake river to the Kunyene confluence to Toten, thence into the lake together with the Kunyene water. On the other hand, when the Thamalakane and Kunyene rivers are low, all the water of the former flows down the Botletli, and the water of the latter, being dammed by the sand-bar in the bed of the arm of the lake (also called the Lake river) between Toten and the lake mouth, makes its way eastwards to the Thamalakane-Botletli junction, there joining the Thamalakane water down the Botletli."

Stigand says that he was informed that the Makuba were much more numerous in Ngamiland in former times than they were in 1910, and that this decrease in population was due to an epidemic which decimated them. He says large numbers of them lived on the shores of the lake and along the Lake river. He points out that the Batawana lived at Toten until 1885, and in 1886, after the second Matabele raid, their chief, Moremi, moved to Nokanen on the Okovango, 45 miles north of Tsau. After this they moved to Komokaku, thence to Nakalechwe, and thence to Tsau.

Schwarz [23] in 1918 came forward with his all-embracing " Kalahari Scheme ". The theme of the scheme was that whereas formerly the great interior basin of South Africa had been filled with water from large rivers flowing into the interior, these waters had been captured by the Zambesi and the Cunene rivers, and were now being drained into the oceans, instead of into the Kalahari as in the past.

To this draining of the interior Schwarz ascribed the ever increasing droughts which were experienced over South Africa. Restore the central lakes with water, and he thought droughts would be a thing of the past, the rainfall over the Union would be increased, the Kalahari would become a vast flourishing settlement, and the desert would disappear. To do this Schwarz proposed that a weir should be placed across the Chobe near its junction with the Zambesi and also one across the Cunene to the north-west of the Etosha Pan. By this means he proposed to fill with permanent water the Chobe swamps, the Okovango swamps, Lake Ngami, the Great Makari-kari lake depression and the Etosha Pan. With this impounded water available it was suggested that large irrigable

areas might be created, between the Cunene and Etosha Pan, from the Etosha Pan across to Andara, along the Botletle river, and from the Makarikari Lake southwards through the centre of the Kalahari to the Orange River. Schwarz proceeds to attempt to show that the "Ngami Lakes" dried up in 1820, and from this date and to this cause he attributes the drying up of South Africa. Schwarz added little to our knowledge of Ngamiland, which is not surprising, as, unfortunately, he had not visited the area.

Schwarz's "Thirstland Redemption" naturally appealed to a large section of the public who thought that the refilling of the inland lakes would end all their troubles and still allow them to use their land and veld as they had done in the past without any thought for the morrow, and without any consideration for the overgrazed and overtaxed plants—the life-blood of their existence. Consequently the State was pressed on all sides to embark upon the scheme.

In 1923 Stigand ([24]) placed on record a valuable account of the native occupation of Ngamiland. Briefly it is this: "A following of Makubas under Zankotse came from the Linyanti and settled on Lake Ngami about 1750. At the same time another lot of Makubas from the Linyanti settled near Tubu island on the Teoge river, their northern boundary being Namasseri, the Mampukushu living north of this. When Zankotse came to Ngamiland the only inhabitants were the Bushmen; some of them lived in the sandveld, others dwelt amongst the swamps. There were, however, the Makhalahari living at the Kwebe Hills, a distance of some twenty miles south of the eastern end of Lake Ngami. The Makuba lived mostly by fishing but were cultivators of the land and grew grain, maize, kaffir corn, lebelebele corn and tobacco. The Bushmen hunted game and bartered this for tobacco.

"About 1800 Tawana with his Bamangwato followers—the Batawana—arrived at Lake Ngami and drove the Makhalahari from the Kwebe hills and settled there. The Batawana brought the Makhalahari and the Bushmen under subjection but left the Makuba alone. The Batawana with their cattle kept mostly to the sandveld, while the Makuba lived on the lake and rivers. The Batawana naturally extended their range of ranching operations and their cattle posts and their next chief, Moremi I, son of Tawana, settled at the south-western end of Lake Ngami, just south of the Dantsa flats, where he was attacked and raided by Sebituane from Basutoland. Moremi and his people fled to the Kavimba veld on the Chobe, while the Makubas escaped into the swamps. Sebituane then followed after Moremi, seized the Batawana town and chieftainship and settled at Linyanti. Moremi's brother then split up the Batawana and took his followers back to Lake Ngami, to Toten, where they settled.

"Later on Sebituane's son raided Toten, but the Batawana escaped with their cattle to the Kwebe hills, where they defeated their aggressors, and Sekeletu (Sebituane's son) was obliged to flee back to Linyanti. When he returned he met with tribal trouble and died and then the Batawana on the Linyanti returned and joined their people at Toten. About 1883 Lobengula, having heard of the enormous cattle wealth of the Batawana at lake Ngami, sent one of his Matabele impis to raid them at Toten. Most of the Batawana with their cattle escaped on to the islands in the swamps north of Tsau, while Moremi held the Matabele in check at Toten with fire-arms. However, the Matabele rounded up a number of cattle that had been left behind and carried them off.

"Another Matabele raid took place in 1886 but the Batawana escaped with most of their cattle to the islands in the swamps and inflicted heavy loss

on the Matabele with their fire-arms. The Matabele retreated, taking with them again such cattle as they could lay their hands on. After this the Batawana moved their town to Nokanen, north of Tsau, where they stayed from 1886–1888. From now onwards Lake Ngami began to dry up as the Mokolane river was beginning to stop running."

Stigand refers in this paper to an old native tradition that Ngami has never been at any time "anything more than a shallow, flooded depression or large open pateh of swamp water.

"Further, Mokwati—who must have been born somewhere about the year 1820, or perhaps even a year or two earlier—has often declared to me that when he was a boy he often heard the very old men of his family relating how, when they were boys, there was no lake, but that the Mokolane river (Teoge) ran through a plain wooded with mochwere (*Combretum primigenum*), camel thorn, and other trees, and that they used to play along its banks. That later this river overflowed its banks and flooded this Ngami wooded plain. Mokwati further says that when the lake started to dry up and the water receded, the receding water disclosed old stumps of mochwere, mogotlo (camel thorn) and matshiara trees on the lake floor, 'thus proving the truth of what our fathers had told us'."

Stigand points out that the natives were continually destroying the dried up reed beds on Ngami, by burning and ploughing, as they were highly prized as rich land resulting from the burnt ash. Stigand also says that the natives claim that the Ngoga river in times past was not so strong as it is today, and that it was only formed during the early part of Letcholathebe's reign, as the result of hippo paths leading from one "molapi" to another. Stigand concludes his paper thus: "If, however, the process of desiccation of this country continues in the ever-steadily progressing manner that it has done during the last hundred years, then at no very distant time it will be as free from malaria as the Kalahari is today, but then it will also be a thirstland."

In 1925 the Government of the Union undertook to investigate "The Kalahari Seheme" and the matter was entrusted to the department of Irrigation and Dr. A. L. du Toit ([3]) was appointed officer in charge of an expedition which it was decided to despatch to the area to explore more particularly the river system of the Zambesi in its relation to the Okovango system. du Toit ([3]) in a clear and able report styled "Report of the Kalahari Reconnaissance of 1925", as a result of the four months' careful observations in the field, confined chiefly to the region between Maun and the Zambesi, came to the conclusion that the climatic conditions had not altered appreciably within the period claimed by Schwarz; that the facts ascertained did not support Schwarz's view of the existence of an ancient "Greater Ngami", and that therefore such an area could not be restored; and that "owing to the immense losses through evaporation and absorption within the Okovango delta and the Linyanti swamps, no extensive scheme of flooding either the Ngami or the Makarikari region is possible without including the bulk of the Zambesi flow." du Toit, in the course of his report, rightly lays special emphasis on the fact that the bulk of the water in the swamps is at present lost by evaporation to the atmosphere in just the locality where Schwartz desired such action to take place, and that this has no effect whatever on the climate or on the surrounding vegetation.

Dealing with the Mababe depression, du Toit is inclined to the view that a lake once extended over it, but that it has only been intermittently flooded during the last three-quarters of a century. Regarding Lake Ngami du Toit also thinks that this may possibly have been a permanent lake in the distant

past, but he points out that there is no decisive evidence to support the view that the region, during the past few centuries, has been very different from what it is today.

In order to explain the origin of the Okovango-Mababe-Zambesi depression du Toit suggests that an actual sagging of the earth's crust took place over the area involved and that, prior to this movement, the big rivers flowed across the Kalahari in well defined single channels.

The Okovango, for instance, flowed straight across to the Botletle and from thence through the Makarikari and, finally, to the Limpopo. " The ' delta ' not having yet come into existence, the Makarikari could well have been an immense lake, as is so generally assumed. With the sinking of the crust athwart this drainage system, the flow of the rivers would have been intercepted, and the Makarikari deprived of its supply."

Although the death-blow had been administered to " The Kalahari Scheme " Ngamiland still continued to attract attention and catch the public eye. The next phase was the exploration of the Kalahari desert with the primary object of finding cattle routes to the east and north by which markets could be obtained for the stock produced in Ngamiland. In these attempts Clifford and Rey have each played their part.

Clifford ([25]) in June, 1928, crossed the Kalahari by motor lorry from Mahalapye to Ghanzi with the object of seeing whether it was feasible to establish a cattle route over this area in order to bring cattle from the Ghanzi area eastwards to Mahalapye. Clifford was much struck with the numerous herds of native cattle grazing on the alluvial pasturage of Lake Ngami, but adds that it " could without doubt be cultivated as intensively as Lower Egypt ". Arrangements were also made by Clifford, at Maun, to investigate the establishment, if possible, of a fly-free cattle route east of the Mababe flats in order to retain the Katanga markets for Ngamiland stock.

In June, 1929, Clifford ([26]) made a second expedition into the Kalahari, again with the object of establishing a direct route across the Kalahari from east to west, for the exit of cattle, and also to fix more accurately the boundaries of the Great Makarikari Salt Lake, in view of a possible railway route being established from Rhodesia to Walvis Bay. Clifford traversed (by motor) and fixed the main boundaries of the lake and made general observations of value regarding the country. He also crossed the Botletle river near Namissau and followed its course down to Rakops. His experience at Rakops is of special interest. He says : " We spent a day in Rakops, and left the next morning for Mopepe, via Gomo, in a blinding dust storm. These storms are apparently common in July and August and so dense was the dust that at times we could scarcely see the radiator and had to halt until there was a temporary abatement of the wind and the road ahead became visible." " During the journey between Rakops and Gominyan a dust storm raged which obscured the whole country and made it necessary to stop occasionally."

Rey ([27]) in a paper entitled " Ngamiland and the Kalahari " published in 1932, reviews the general situation in the Bechuanaland Protectorate and refers to certain surveys which had been carried out during the past two and a half years with the object of bringing about a better development of the country. Rey points out that the principal industry is cattle-raising and that the efforts of the Administration are being devoted chiefly to the improvement of stock and the securing of markets.

As a result of the different surveys made it is concluded that all development and progress in the cattle industry depends entirely on adequate supplies of water being obtained and being made available, and it is urged that all efforts should be directed to this end.

Rey, in referring to a trip which he had undertaken through the Kalahari, alludes to the trampled out state of the country around the water holes that he passed. Maun Rey describes as " one of the most unpleasing native villages it has been my lot to visit. Not a blade of grass, not a vestige of green relieved the dirty, sandy, arid space over which the village straggled ; everything within striking distance had been eaten down or trampled out by cattle or withered by the blazing sun " ; Rey's description of Maun after a period of only 14 years' occupation tells its own tale, and it could well be applied also to most other native towns in the Bechuanaland Protectorate.

EXISTING CONDITIONS IN NGAMILAND.

A study of the literature just mentioned on Ngamiland has brought out several interesting points which may now be referred to. It leaves little doubt but that Ngamiland has been the home of a considerable native population for at least two centuries.

The chief centres of population have been the Botletle River, the Ngami river, the Tamalakane river, the entire length of the Teoge river (the main feeder to Lake Ngami), both banks of the Okovango river, from the head of its delta northwards to Andara.

This population has consisted of stockmen, herdsmen, tillers of the land and hunters. All have contributed in their way to the destruction of the vegetation, the removal of soil, and the general exsiccation of the country, necessitating from time to time a shift of occupation. It is on record that wherever this native occupation has been for any length of time, perennial springs have ceased to flow there, rivers and swamps have dried up, grassland has been converted into thorn scrub, and thorn scrub has been turned into a veritable desert. All these phases of the destructive influence of man in a semi-arid climate are now to be seen in no unmistakable manner in Ngamiland wherever man has sojourned, and to me this was one of the most striking features of the trip.

When the rivers flow one of the results of all this exsiccation in an almost dead level plain is a heavy deposition of mud and silt, whereas before man's advent on the scene, this deposit was almost a negligible quantity. This deposition of mud in Lake Ngami has been remarked on by several of the early travellers quoted above and tells its own true tale of what had been taking place on the upper reaches of the Teoge river.

There can be little doubt, therefore, that man has been responsible for the exsiccation of large tracts of country and at the same time for the rapid silting up of its river systems. This would result in the diversion of streams and flood channels, creating thereby new swamps, and to loss of more water by absorption over the affected areas. There is ample evidence that this has frequently occurred in the Okovango delta. Man-made drought is therefore, I think, largely responsible for the exsiccation of much of Ngamiland.

At the time of our visit, when we crossed the Tamalakane about three miles below Maun on June 13th, the flood water was then running strongly and clearly rising. We then proceeded to Lake Ngami and went on to Ghanzi, recrossed Lake Ngami and travelled up the dry bed of the Teoge river. We met the first flood water of the Teoge at Ngarekao on June 18th. Proceeding northwards we did not meet with flooded country until we reached Mutinyane, north of Gomare, on June 20th, and found it impossible to proceed much further north on account of the flooded state of the country. Returning by the same route to Nokanen, we struck eastwards from here into the swamps and travelled a distance of ten miles before the flood waters were encountered on June 22nd. We then returned to Maun on June 26th, where we found that the Tamalakane had risen very considerably since our first visit.

On June 27th from Maun we attempted to explore by car the south bank of the Boro river, which was then in full flood, and was running a strong stream. We had not proceeded more than a few miles before we got bogged in what looked like dry country, but which was evidently well soaked below by the rising floods, and thus were compelled to abandon the venture.

On June 29th we examined the lower reaches of the Gomoti river, which was full of water, but saw no evidence of flood water from it.

On June 30th we travelled from Maun down the south bank of the Tamalakane river to its junction with the Botletle river at Dikgatlon. The water was then flowing into the Botletle, but in no great volume. It had, however, flowed down the Botletle for a distance of some six miles but had not yet reached Simadupi drift. On July 1st we made a further exploration of the Gomoti river and examined the higher reaches where it was reported to be blocked up with Gomoti trees. We saw no evidence of the actual stoppage of the flow of water by these trees, but at this locality we found the river actually spilling over and flooding the surrounding country. The flooding was taking place from spots where the hippopotami had worn down the banks by emerging from deep pools and had worn tracks from here to neighbouring palm forests. These tracks served as spillways for the flood water. We took leave of Maun on July 3rd, by which time the Tamalakane river was running in full flood and had submerged all traces of the mealie lands which were so conspicuous when we first made its acquaintance three weeks earlier in its bed.

From Maun we proceeded to the Mababe flats and from here attempted to explore the eastern side of the Okovango delta by travelling up the north bank of the Mochaba river. We did not, however, get further than Kwaai, where on July 5th the flood water in the swamps barred further progress.

Briefly then, it may be stated that at the time of our visit the Tamalakane river was being filled by the following affluents, the Boro river, the Santantadide river and the Gomoti river.

The flood water in the Mochaba river had reached as far as Kwaai, while the Teoge river was beginning to flood the country east of Nokanen.

I have stated previously that an examination of the vegetation in these areas suggests that the plant succession in the eastern rivers, the Gomoti and the Mochaba, has advanced further than that seen either on the Teoge river or on the Boro river. For this reason I take the view that the northern arm of the Okovango is possibly the original river which ran across the dead flat Kalahari plain, first as the Gomoti and filled the Tamalakane, the Botletle, Lake Dow,

the Makarikari Lake and its adjoining salt pans. In the course of time the Gomoti, through plant succession, gradually silted up, causing the Ngoga river to send out a branch, the Moanachira, becoming finally the Mochaba, to flood the Mababe flats. Further silting of this river system through natural processes then probably gave rise to the birth and growth of the western arm, the Teoge river. This in due course filled Ngami and possibly overflowed and reached the Botletle river. Natural causes and plant succession, aided then very considerably by the advent of man, and his stock on the scene, again, but this time more rapidly, brought about silting, exsiccation, and flooding of new areas along the Teoge—hence the stoppage of this river system and the drying up of Ngami. This damming of the water in one of the main arms was bound, sooner or later, to cause a further breaking out of the waters higher up and in this stage of its development perhaps the Boro river took a share.

The fact that the great depressions, Ngami and the Makarikari, were once undoubtedly filled with water, at least part of the year, and are so no longer, is remarked on by all who have been interested in this country for some reason or other, and it has been a matter for speculation how this came about.

There is no evidence that I am aware of to show that the bulk of water coming down the Okovango from the Angola Highlands is less than in earlier times, and the puzzle has been to account for the fate of the water which previously reached the great lake depressions and was there evaporated and (or) absorbed. It seems to me, however, that a very simple explanation is afforded by the process of natural plant succession in this very extensive and unusually flat country. It is therefore not improbable that in ages gone by the present swampy delta of the Okovango was an enormous flat plain covered by typical Kalahari vegetation and that the Okovango itself flowed very slowly over this plain, eventually reaching and filling the depressions known as Lake Dow, Makarikari, Ntwetwe, etc., etc. The flow of the river was a seasonal one then, as now, and the various lakes were thus only seasonally filled. As time passed, and plant succession took its normal course, vegetable remains were slowly but surely deposited in the very slow-moving river until gradually the river became shallower. Branches were then formed and the process of gradual deposition went on in the several branches of the Okovango with the result that part of the seasonal flow of water gradually spilled over and slowly oozed and meandered over the plains, altering the vegetation in the course of time till the whole extent of country became the present-day swamps. The enormous increase in exposed water surface, and hence in evaporation, involved therein, and in addition the great absorptive capacity of the marshes is quite sufficient to account for the fate of the water which in earlier times reached the great depressions.

I therefore see no need to account for the loss of water which once undoubtedly filled the Makarikari depressions by invoking the aid of a change of climate or of assuming that a sagging of the earth's crust over the area has taken place.

It seems to me quite possible that the water, instead of being evaporated in the Makarikari and Ngami as in the past, is now being withheld in the Okovango delta and is being absorbed and evaporated there.

Much work, however, remains to be done in this area and a flood of light would undoubtedly be shed on its history if an aerial survey were made, combined with one made on the ground.

THE GRASS COLLECTION.

The expedition made collections in two very different types of country, viz., in the sandy wastes of the arid Kalahari and in the swamps and alluvial plains of the Okovango and Linyanti delta systems. In the former the grasses

were the product of a summer rainfall—erratic and varying from 12 to 20 inches—while the latter country supported grasses that were subjected to flooding during the winter months as well as to a summer rainfall. Under these different conditions two grass floras entirely different in composition were found, and under these circumstances it was only natural to suppose that the grasses secured would be valuable for summer rainfall conditions, for winter rainfall conditions, and for irrigated land in winter or early spring. The expectations of the expedition were more than realised. A vast store of valuable grasses was tapped and the expedition secured, during its six weeks' absence from Pretoria, living material of over 400 different kinds of pasture and hay grasses, and after its return to Pretoria over 15,000 rooted plants were potted out. The method followed in collecting these grasses was that which previous collecting had proved to be most successful in the veld, viz. : As soon as a clump of grass was dug out it was put in a cotton bag and duly labelled. These bags were then tightly packed in collapsible cardboard boxes which were despatched to Pretoria as soon as possible from convenient points (figs. 173 and 174). On arrival at Pretoria the grasses were immediately planted out, either in tins or in pots (figs. 175, 176 and 177), and then kept in a greenhouse or shade house until new growth appeared, after which they were divided up and planted out of doors.

Over 90 per cent. of these grasses have now been successfully established and time alone will show their ultimate value. Briefly it may be stated that they consist roughly of the following genera :—

Digitaria	31 per cent.	*Urochloa*	2 per cent.
New or unknown grasses	18 per cent.	*Chloris*	2 per cent.
Panicum	13 per cent.	*Acroceras*	1 per cent.
Setaria	12 per cent.	*Andropogon*	5 per cent.
Pennisetum	5 per cent.	*Eragrostis*	
Cynodon	5 per cent.	*Sporobolus*	
Echinochloa	4 per cent.	*Paspalum*	
Brachiaria	2 per cent.		

The Digitarias from the sandy desert have shown remarkable growth after being planted out at the Rietondale Pasture Research Station. Many single plants which were planted out during the first week in November at a distance of twenty feet apart had by the middle of January shown such surprising covering capacity that many adjoining plants were intermingling (fig. 178). Some of these individual plants had by this time covered a space of over five hundred square feet.

The majority of these desert *Digitarias* exhibit dense leafage and in every respect show great promise as good and suitable pasture strains. New *Panicums* suitable for hay and pasture purposes have also been obtained (fig. 179). Remarkable *Setarias*, exhibiting succulence and dense leafage suitable for dairy and other purposes have also been secured (figs. 180–181). Valuable strains of *Cenchrus* suitable for hay and pasturing have been obtained, as well as new and promising species of *Paspalum*, *Echinochloa*, *Urochloa* and *Acroceras* (fig. 182).

This collection of grasses having been made, it it now imperative that it be carefully looked after, detailed records kept of growth and behaviour. and that the fullest use be made of it through experimentation and research in the various parts of the country. A collection such as this should be treasured and studied by trained and skilled botanists, who alone can put such material to the best possible use. Unless a country can turn its plant growth to full advantage such a country can only deteriorate. Loss of natural plant cover

in semi-arid countries leads to erosion and loss of precious soil. Grass is the most valuable plant cover that semi-arid land possesses, and until this is generally and fully appreciated little real progress in soil conservation will be made.

BIBLIOGRAPHY:

(1) Schwarz, E. H. L.—"The Kalahari or Thirstland Redemption." *Cape Town*, 1920.

(2) Kanthack, F. E.—"Notes on the Cunene River." *Vol.* 57, 1921. *The Geographical Journal.*

(3) du Toit, A. L.—"Report of the Kalahari Reconnaissance of 1925." *Pretoria*, 1926.

(4) Livingstone, D.—"Extracts of letters from the Rev. David Livingstone, dated from the Missionary Station at Kolobeng, South Africa." *The Geographical Journal, Vol. XX*, 1850.

(5) Livingstone, D.—"Missionary Travels and Researches in South Africa." *London*, 1857.

(6) Oswell, W. C.—"Extract of a letter from William Cotton Oswell, esq., to Captain Frank Vardon regarding the Interior Lake of South Africa." *The Geographical Journal, Vol.* 20, 1850.

(7) Galton, Francis.—"The Narrative of an Explorer in Tropical South Africa." *London*, 1853.

(8) Leyland, J.—"Adventures in the Far Interior of South Africa, including a journey to Lake Ngami." *London*, 1866.

(9) Andersson, C. J.—"Lake Ngami." *London*, 1856.

(10) Chapman, James.—"Travels in the Interior of South Africa." *Vols. I and II, London*, 1868.

(11) Green, F. J.—"Narrative of an Expedition to the north-west of Lake Ngami." *The Eastern Province Monthly Magazine, Vol. I*, 1857.

(12) Baines, T.—"Exploration in South-West Africa." *London*, 1864.

(13) Schinz, H.—"Deutsch-Südwest-Afrika." *Oldenburg und Leipzig*, 1891.

(14) Passarge, S.—"Die Kalahari." *Berlin*, 1904.

(15) Gibbons, A. St. H.—"Africa from South to North, through Barotseland." *London*, 1904.

(16) Lugard, E. J.—"The Flora of Ngamiland." *Kew Bull. No.* 3, *London*, 1909.

(17) Brown, N. E.—"The Flora of Ngamiland." *Kew Bull. No.* 3, *London*, 1909.

(18) Selous, F. C.—"Big Game in South Africa and its relation to the Tse-tse Fly." *Jour. African Soc., vol. VIII*, 1908.

(19) Seiner, F.—"Pflanzengeographische Beobachtungen in der Mittel-Kalahari." *Englers Botanische Jahrbucher. Vol.* 46, 1912.

(20) Streitwolf, H.—"Der Caprivizipfel Susserott's Kolonialbibliothek." *Bd.* 21, 12–32, 1911.

(21) Stigand, A. G.—"Notes on Ngamiland." *The Geographical Journal, April*, 1912.

(22) Stigand, A. G.—"Notes on Ngamiland." *Trans. Roy. Soc. S. Africa. Vol. III, pp.* 379–391, 1913.

(23) Schwarz, E. H. L.—"The Kalahari Scheme." *The Star, Johannesburg, January* 31st, 1918.

(24) Stigand, A. G.—"Ngamiland." *The Geographical Journal, vol. LXII*, 1923.

(25) Clifford, B. E. H.—"A Journey by Motor Lorry from Mahalapye through the Kalahari Desert." *Geogr. Journ., vol. LXXIII*, 1929.

(26) Clifford, B. E. H.—"A reconnaissance of the Great Makarikari Lake." *Geogr. Journ., vol. LXXV*, 1930.

(27) Rey, C. F.—"Ngamiland and the Kalahari." *Geogr. Journ., vol. LXXX*, 1932.

Fig. 1.—Martin's Drift on the Crocodile or Limpopo River.

Fig. 2.—*Acacia pallens* in the Limpopo Valley.

Figs. 3.—Native lands south-east of Serowe with bush and tree of *Acacia*, *Boscia* and *Sclerocarya*.

Fig. 4.—Native lands south-east of Serowe with bush and tree of *Acacia*, *Boscia* and *Sclerocarya*.

Fig. 5. *and* 6.—Deep sandveld covered with scattered bush and tall grass.

Fig. 6.—Deep sandveld covered with scattered bush and tall grass.

Fig. 7.—Inkowane Pan.

Fig. 8.—Grass-plains with scattered thornbush on the horizon.

Fig. 9.—Mopane bush and thornscrub.

Fig. 10.—*Hoodia Lugardi*, near Lothlekane Well.

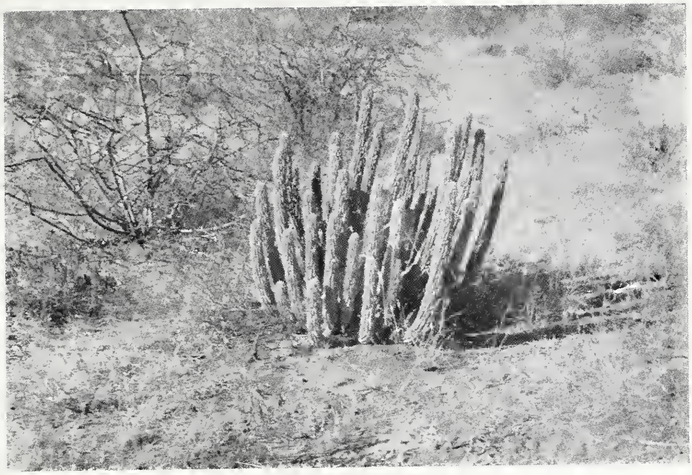

Fig. 11.—*Hoodia Lugardi* near Lothlekane Well.

Fig. 12.—Lothlekane Well.

Fig. 13.—Mopane scrub between Lothlekane Well and Chukutsa Pan.

Fig. 14.—Chukutsa Pan.

Fig. 15.—*Commiphora* trees on the edge of Chukutsa Pan.

Fig. 16.—*Acacia* parkland country at the Botletle river.

Fig. 17.—Fringing bush of *Combretum* and *Croton* on the banks of the Botletle river near Rakops.

Fig. 18.—Open grassy plains north-east of Rakops.

Fig. 19.—Kalahari scrub between Rakops and Maun.

Fig. 20.—Kalahari sandveld between Rakops and Maun.

Fig. 21.—Kalahari scrub between Rakops and Maun.

Fig. 22.—Kalahari scrub between Rakops and Maun.

Fig. 23.—Botletle River at Samadupi Drift.

Fig. 24.—Botletle River at Samadupi Drift.

Fig. 25.—*Acacia litakunensis* and thickets of *Sansevieria* on the Botletle river near Samadupi Drift.

Fig. 26.—Makalamabedi near the Botletle river.

Fig. 27.—Makalamabedi near the Botletle river.

Fig. 28.—Mopane forest between Samadupi Drift and the Tamalakane river.

Fig. 29.—Mopane forest between Samadupi Drift and the Tamalakane river.

Fig. 30.—The bank of the Tamalakane river south-west of Maun.

Fig. 31.—The bed of the Tamalakane river south-west of Maun. River fringes covered with *Echinochloa pyramidalis.*

Fig. 32.—Riverine forest on the melapoes of the dry Kunyene.

Fig. 33.—Riverine forest on the melapoes of the dry Kunyene.

Fig. 34.—Tsetse Fly country between Maun and Toten.

Fig. 35.—Showing the effect of past native occupation at Toten.

Fig. 36.—A dry well near Toten.

Fig. 37.—Showing the effects of past native occupation at Toten.

LAKE NGAMI.

Fig. 38.—Sehitwa.

Fig. 39.—Camelthorn forests fringing " The Lake " (Ngami).

Fig. 40.—The " Lake " floor covered with *Panicum repens* and *Cynodon* sp.

Fig. 41.—The " Lake " floor covered with *Panicum repens* and *Cynodon* sp.

*Fig.*42.—Camelthorn forest encroaching on the floor of the Lake.

Fig. 43.—Camelthorn forest encroaching on the floor of the Lake.

Fig. 44.—Camelthorn forest encroaching on the floor of the Lake.

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Fig. 45.—Dense growth of *Blumea gariepina* on the floor of the Lake.

Fig. 46.—Dense growth of *Blumea gariepina* on the floor of the Lake.

Fig. 47.—Dense growth of *Blumea gariepina* on the floor of the Lake.

Fig. 48.—Dense growth of *Blumea gariepina* on the floor of the Lake.

Fig. 49.—*Acacia litakunensis* near Bodiben.

Fig. 50.—*Acacia litakunensis* near Bodiben.

Fig. 51.—Thorn scrub around Masarwanyane pan.

Fig. 52.—Thorn scrub around Masarwanyane pan.

Fig. 53.—*Eragrostis pallens* on Kalahari sand near Gray's pan.

Fig. 54.—Thickets of *Acacia detinens* at Dekar farm.

Fig. 55.—Trodden out country on limestone outcrop at Ghanzi.

Fig. 56.—Trodden out country on limestone outcrop at Ghanzi.

Fig. 57.—Trodden out country on limestone outcrop at Ghanzi.

Fig. 58.—Trodden out country on limestone outcrop at Ghanzi.

Fig. 59.—Flood waters of the Taoge River at Chukudu's Post, north of Nokanen.

Fig. 60.—Flood waters of the Taoge river at Chukudu's Post, north of Nokanen.

Fig. 61.—Flood waters up the Taoge river at Chukudu's Post, north of Nokanen.

Fig. 62.—Sehitwa store.

Fig. 63.—The camelthorn forest belt on the northern edge of Lake N'gami.

Fig. 64.—The camelthorn forest belt on the northern edge of Lake N'gami.

Fig. 65.—The camelthorn forest belt on the northern edge of Lake N'gami.

Fig. 66.—Camelthorn forest on the old channels of the Maputle river.

Fig. 67.—Camelthorn forest on the old channels of the Maputle river.

Fig. 68.—Dense growth of *Schmidtia* grass in the old channels of the Maputle river.

Fig. 69.—Open parkland country north of the Maputle river.

Fig. 70.—Open parkland country north of the Maputle river.

Fig. 71.—Country showing the result of human occupation.

Fig. 72.—Country showing the result of human occupation.

Fig. 73.—Country showing the result of human occupation.

Fig. 74.—Country showing the result of human occupation.

Fig. 75.—Country between Nakalechwe and Tsau showing result of human occupation.

Fig. 76.—Country between Nakalechwe and Tsau showing result of human occupation.

Fig. 77.—Country between Nakalechwe and Tsau showing result of human occupation.

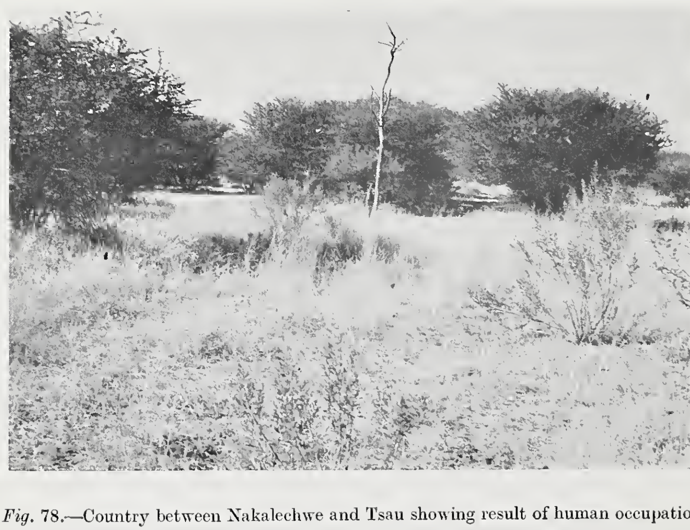

Fig. 78.—Country between Nakalechwe and Tsau showing result of human occupation.

Fig. 79.—Country between Nakalechwe and Tsau showing result of human occupation.

Fig. 80.—Country near Tsau.

Fig. 81.—Country near Tsau.

Fig. 82.—Country near Tsau.

Fig. 83.—Fringing forest between Tsau and Gomare.

Fig. 84.—Fringing forest between Tsau and Gomare.

Fig. 85.—Fringing forest between Tsau and Gomare.

Fig. 86.—Fringing forest between Tsau and Gomare.

Fig. 87.—Thickets of camelthorn, *Acacia detinens*, *Acacia arabica* and *Dichrostachys* between Tsau and Gomare as the result of heavy overstocking in the past in this area.

Fig. 88.—Thickets of camelthorn, *Acacia detinens*, *Acacia arabica* and *Dichrostachys* between Tsau and Gomare as the result of heavy overstocking in the past in this area.

Fig. 89.—Thickets of camelthorn, *Acacia detinens, Acacia arabica* and *Dichrostachys* between Tsau and Gomare as the result of heavy overstocking in the past in this area.

Fig. 90.—Thickets of camelthorn, *Acacia detinens, Acacia arabica* and *Dichrostachys* between Tsau and Gomare as the result of heavy overstocking in the past in this area.

Fig. 91.—The Tamalakan river before flooding had taken place.

Fig. 92.—The Tamalakan river before flooding had taken place.

Fig. 93.—The Tamalakan river before flooding had taken place.

Fig. 94.—The Tamalakan river before flooding had taken place.

Fig. 95.—The Tamalakan river before flooding had taken place.

Fig. 96.—The Tamalakan river before flooding had taken place.

Fig. 97.—The Tamalakan river before flooding had taken place.

Fig. 98.—The Tamalakan river before flooding had taken place.

Fig. 99.—The Tamalakan river before flooding had taken place.

Fig. 100.—The Tamalakan river before flooding had taken place.

Fig. 101.—The Tamalakan river between the junction of the Botletle and the Mogogelo river.

Fig. 102.—The Tamalakan river between the junction of the Botletle and the Mogogelo river.

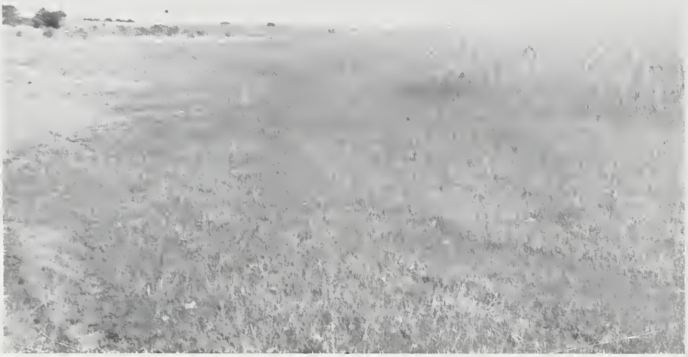

Fig. 103.—The Tamalakan river between the junction of the Botletle and the Mogogelo river.

Fig. 104.—The Tamalakan river between the junction of the Botletle and the Mogogelo river.

Fig. 105.—South bank of the Tamalakan north of Maun.

Fig. 106.—South bank of the Tamalakan north of Maun.

Fig. 107.—Palm-stands in the Gomoti river area.

Fig. 108.—Palm-stands in the Gomoti river area.

Fig. 109.—Palm-stands in the Gomoti river area.

Fig. 110.—Palm-stands in the Gomoti river area.

Fig. 111.—The Gomoti tree (*Ficus verruculosa*).

Fig. 112.—The Gomoti tree (*Ficus verruculosa*).

Fig. 113.—The Gomoti tree (*Ficus verruculosa*).

Fig. 114.—The Gomoti tree (*Ficus verruculosa*).

Fig. 115.—The Gomoti tree (*Ficus verruculosa*).

Fig. 116.—The Gomoti tree (*Ficus verruculosa*).

Fig. 117.—The Gomoti tree (*Ficus verruculosa*).

Fig. 118.—*Panicum repens* in the Gomoti area.

Fig. 119.—*Panicum repens* in the Gomoti area.

MAUN TO MABABE FLATS.

Fig. 120.—Thornbush of *Acacia dulcis, A. detinens, Bauhinia macrantha, Terminalia sericea* and *Combretum spp.*

Fig. 121.—Thornbush of *Acacia dulcis*, *A. detinens Bauhinia macrantha*. *Terminalia sericea* and *Combretum spp*.

Fig. 122.—Thickets of *Bauhinia macrantha*.

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Fig. 123.—*Mopane* forest on the edge of the Mababe flats.

Fig. 124.—*Mopane* forest on the edge of the Mababe flats.

Fig. 125.—*Cenchrus ciliaris* dominating the grassland on the Mababe flats.

Fig. 126.—Open grassland on the Mababe flats.

Fig. 127.—*Cymbopogon* and *Sorghum* dominating the grassland.

Fig. 128.—*Cymbopogon* and *Sorghum* dominating the grassland.

Fig. 129.—*Cenchrus ciliaris* dominating the drier area.

MABABE FLATS TO KACHIKAU.

Fig. 130.—Mopane forests around Tsotsoroga pan.

Fig. 131.—Mopane forests around Tsotsoroga pan.

Fig. 132.—Mopane forests around Tsotsoroga pan.

Fig. 133.—Mopane forests around Tsotsoroga pan.

Fig. 134.—Mopane forests around Tsotsoroga pan.

Fig. 135.—Mopane forests around Tsotsoroga pan.

Fig. 136.—Mopane forests around Tsotsoroga pan.

Fig. 137.—Mopane forests around Tsotsoroga pan.

Fig. 138.—Mopane forests around Tsotsoroga pan.

Fig. 139.—Thickets of *Terminalia sericea*.

Fig. 140.—Thickets of *Burkea africana*.

Fig. 141.—*Acacia* thickets.

Fig. 142.—Kalahari thorn scrub and mopane bush around Goha hills.

Fig. 143.—Kalahari thorn scrub and mopane bush around Goha hills.

Fig. 144.—Kalahari thorn scrub and mopane bush around Goha hills.

Fig. 145.—High forest of *Baikiaea*, *Berlinia* and *Brachystegia*, north of Goha Hills.

Fig. 146.—High forest of *Baikiaea*, *Berlinia* and *Brachystegia*, north of Goha Hills.

Fig. 147.—High forest of *Baikiaea*, *Berlinia* and *Brachystegia*, north of Goha Hills.

Fig. 148.—High forest of *Baikiaea*, *Berlinia* and *Brachystegia*, north of Goha Hills.

Fig. 149.—The grass flora of tall *Andropogons, Panicums, Digitarias, Chloris* and *Setarias* near Kachikau.

Fig. 150.—The grass flora of tall *Andropogons, Panicums, Digitarias, Chloris* and *Setarias* near Kachikau.

Fig. 151.—The grass flora of tall *Andropogons, Panicums, Digitarias, Chloris* and *Setarias* near Kachikau.

Fig. 152.—Open deciduous woodland in the neighbourhood of the Goha Hills.

Fig. 153.—*Baphia Obovata* Sching in open deciduous woodland in the neighbourhood of the Goha Hills

Fig. 154.—*Amblygonocarpus Obtusangulus* Harms in open deciduous woodland in the neighbourhood of the Goha Hills.

Fig. 155.—Open deciduous woodland in the neighbourhood of the Goha Hills.

THE SWAMPS OF THE LINYANTI.

Fig. 156.—Kachikau.

Fig. 157.—Kachikau.

Fig. 158.—Open grassland between Kachikau and Kasane.

Fig. 159.—Open grassland between Kachikau and Kasane.

Fig. 160.—*Phoenix reclinata* stands between Kachikau and Kasane.

Fig. 161.—Tall *Cymbopogons*, *Panicum repens* and *Andropogon eucomus*.

Fig. 162.—Tall *Cymbopogons*. *Panicum repens* and *Andropogon eucomus*.

Fig. 163.—*Phragmites* stands in the swamps of the Linyanti.

Fig. 164.—*Phragmites* stands in the swamps of the Linyanti.

Fig. 165.—Stands of *Echinochloa*, *Setaria* and *Pennisetum* in the *Phragmites* and *Papyrus* swamps of the Linyanti.

Fig. 166.—Stands of *Echinochloa*, *Setaria* and *Pennisetum* in the *Phragmites* and *Papyrus* swamps of the Linyanti.

Fig. 167.—*Echinochloa pyramidalis* in the *Phragmites* and *Papyrus* swamps between Kachikau and Kasungulu.

Fig. 168.—Fringing forest between Kachikau and Kasungulu.

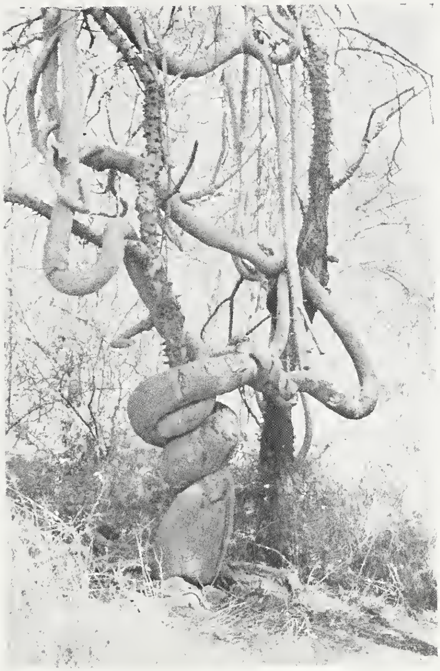

Fig. 169.—*Fockea* sp. between Kachikau and Victoria Falls.

Fig. 170.—*Berchemia discolor* near Kabulabula.

Fig. 171.—Open forest between Kasane and Victoria Falls.

Fig. 172.—Open forest between Kasane and Victoria Falls.

Fig. 173.—Showing method of packing grasses for despatch to Pretoria (in collapsible cardboard boxes).

Fig. 174.—Showing method of packing grasses for despatch to Pretoria (in collapsible cardboard boxes).

Fig. 175.—Unpacking the grass collections for planting out.

Fig. 176.—The grasses potted for rooting.

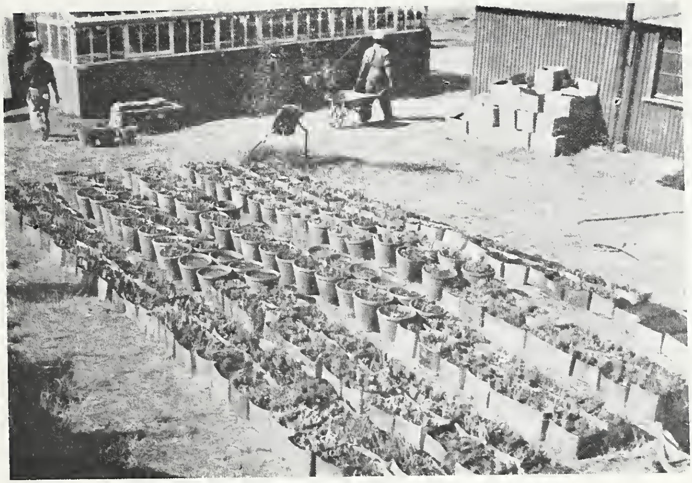

Fig. 177.—Portion of the collection just after potting.

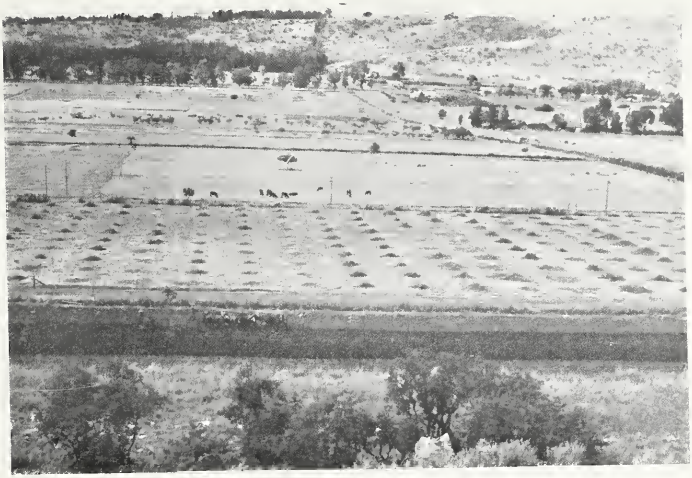

Fig. 178.—Grasses established in the field and showing the growth from one cutting.

Fig. 179.—The grass collection well established.

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Roadside Observations on
THE VEGETATION OF EAST AND CENTRAL AFRICA

by

Dr. I. B. POLE EVANS
C.M.G., M.A., D.Sc., F.L.S.

BOTANICAL SURVEY MEMOIR No. 22
WITH 383 PLATES AND 1 MAP

Price 10/-

Roadside Observations on

THE VEGETATION OF EAST AND CENTRAL AFRICA

on a journey from Pretoria to Kenya Colony

May 27th to September 10th, 1938

BY I. B. POLE EVANS

C.M.G., M.A., D.Sc., F.L.S.

former Chief of the Division of Plant Industry, Department of Agriculture, Pretoria, and former Director of the Botanical Survey of the Union of South Africa

BOTANICAL SURVEY MEMOIR No. 22

WITH 383 PLATES AND 1 MAP

UNION OF SOUTH AFRICA—DEPARTMENT OF AGRICULTURE

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FOREWORD.

This expedition, undertaken by Dr. I. B. Pole Evans during the year preceding his retirement, was a fitting swan song to his career as Chief of the Division of Plant Industry and Director of Botanical Survey of the Union of South Africa.

The title of this memoir indicates that there was no opportunity for a prolonged study of the vegetation in any one area, yet the account of the spoils, with the excellent series of illustrations, is sufficient proof that no time was wasted.

The collection and introduction of grasses to the Union was, as in previous expeditions by Dr. Pole Evans, given high priority. Many of them showed considerable promise from when they were first established at Rietondale and, when their full potentialities have been tested, it is anticipated that at least some of them will be put to uses of substantial economic importance under local conditions. East Africa has already supplied South Africa with such important agricultural grasses as Kikuyu, Elephant grass and Napier fodder.

A number of the flowering plants introduced into cultivation by the expedition has proved a permanent asset in gardens, such as *Pycnostachys stuhlmannii*. In the genus *Aloe*, which received special attention, several species new to science were recorded and have since been illustrated and described in " Flowering Plants of Africa ".

To-day, when we read accounts of the journeys of exploration of botanists in the Cape from the time of Thunberg (1772–75) to that of Burchell, Drege, Ecklon and Zeyher early in the 19th century, we generally marvel at the results they achieved under the difficult conditions pertaining at the time. The contemporaries of these men were possibly less appreciative of their efforts. So it may prove in the present case. One may now look too eagerly for direct economic benefits from such an expedition.

When the so-called civilisation of this continent of Africa has advanced another two hundred years, when the indigenous vegetation has suffered from its full impact, then will the historic value of this account be seen in its true perspective.

R. A. DYER.
Chief: Division of Botany and Plant Pathology.

Pretoria.
26th May, 1948.

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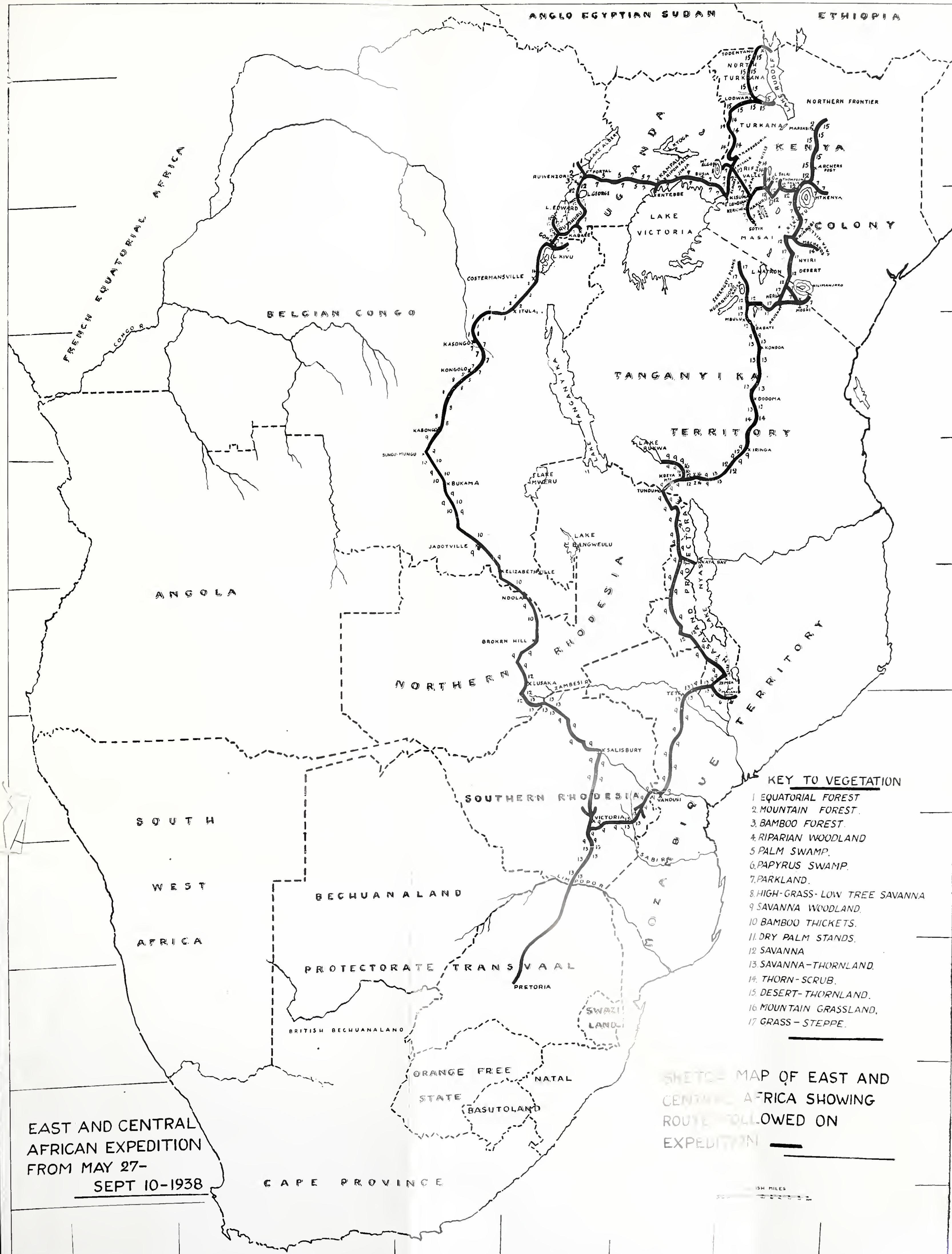

ANGLO EGYPTIAN SUDAN
ETHIOPIA
FRENCH EQUATORIAL AFRICA
BELGIAN CONGO
UGANDA
KENYA COLONY
NORTHERN FRONTIER
TANGANYIKA TERRITORY
LAKE VICTORIA
LAKE RUDOLF
NORTH TURKANA
TURKANA
RIFT VALLEY
MASAI
ANGOLA
NORTHERN RHODESIA
SOUTHERN RHODESIA
NYASALAND PROTECTORATE
LAKE NYASA
MOZAMBIQUE TERRITORY
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MT. KENYA
ARCHERS POST
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3. BAMBOO FOREST.
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MAP OF EAST AND
AFRICA SHOWING
EAST AND CENTRAL AFRICAN EXPEDITION FROM MAY 27- SEPT 10-1938

CHAPTER 1.

The Expedition.

In December, 1937, the Government of Kenya invited me to visit that colony for the purpose of giving some advice with regard to soil erosion and pasture problems.

The Government of Kenya suggested that I should travel to Kenya by air, but the Government of the Union thought that if a well-equipped expedition were sent by road the Union might be able to secure thereby grasses and other plants of economic value. After this was decided I planned to make the return journey through Central Africa, i.e., through Uganda, the Belgian Congo and Northern Rhodesia, if this were possible.

The expedition consisted of three members of my late staff and a constable-mechanic kindly lent by the Commissioner of Police. The staff consisted of Mr. van Rensburg, in charge of the Grass Introduction Station at Rietondale, Pretoria, Mr. Breytenbach, in charge of the Bushveld Pasture Research Station at Rust-der-Winter, and Mr. Erens, the gardener and plant propagator of the Division of Plant Industry. Mr. van Rensburg and Mr. Breytenbach were responsible for the collection of grasses en route, Mr. Erens had to undertake the collection of plants and seeds for the herbarium and for the garden, while the police-mechanic looked after the transport. I interested myself in the vegetation and photographed the chief types observed. The transport consisted of a Studebaker car, a Dodge caravan and a Chevrolet lorry.

We left Pretoria on the 27th of May, 1938, and returned on 10th September after having covered a distance of over 13,000 miles. During this period we collected over 700 living grasses, made a large collection of grass seeds, collected nearly 2,000 botanical specimens and obtained a fairly representative photographic record of the vegetation and country encountered throughout the route. Apart from the few days that we spent in Nairobi, we were constantly on the move, and seldom camped more than one night at any spot.

CHAPTER 2.

The Country Traversed.

Leaving Pretoria we entered Southern Rhodesia at Beit Bridge and then travelled to Victoria, and thence to Umtali via the Birchenough Bridge over the Great Sabi River. From Umtali we turned eastwards into the Portuguese territory of Mozambique, then travelled northwards to the valley of the Zambesi and crossed the Zambesi at Tete. From Tete we went to Blantyre in Nyasaland. From here we attempted to make a visit to Mount Mlanje, which has a rainfall of 90–110 inches per annum and an altitude of over 9,000 feet. Unfortunately we encountered heavy rain here, and were strongly advised not to attempt any climbing of the mountain.

From Mlanje we returned to Zomba, the capital of Nyasaland. From Zomba we crossed the Great Shiré River and travelled northwards along the Nyasaland and Northern Rhodesian borders to Tanganyika, after making a detour to Lake Nyasa at Nkata Bay.

The roads up to here were good ; the only complaint that we had was that the temporary wooden bridges both in Portuguese territory and in Nyasaland were rather on the flimsy side and some of them needed reinforcement before we were able to pass over them with safety.

After entering Tanganyika we took the Great North Road to Mbeya, and from here made a detour over the Mbeya Mountains to Lake Rukwa, passing through the Lupa Goldfields on the way. This road, both on account of the steep climbs and heavy traffic, might well be described as the world's worst. It was thick with dust and a network of potholes. Lake Rukwa is a very shallow lake, so shallow that the greater part of it might best be described as a swamp. My object in going there was to examine the grass flora of this great swamp.

From Lake Rukwa we returned to Mbeya and then followed the Great North Road through the vast semi-arid plains of Tanganyika as far as Babati, where we turned westwards and followed a track through the Masai or Mbulu country to the great Ngorongoro Crater. This has been famous ever since its discovery for the herds of game which it carried and the wonderful natural pastures which it produced. I was anxious to see both.

From the plain below, the crater gives a little indication of the interest which it holds. A rather dull, flat-topped, bush-clad mountain rises very gradually out of the plain and forms a great sloping block of land on the horizon. A motor road cut through dense bush, tropical forest and dense growths of stinging nettles, eventually brings one, after a very stiff climb, on to the southern rim of the crater at 8,000 feet, and from here one looks down on to a great circular floor some three thousand feet below and over twelve miles in diameter. The bottom of the crater is grass covered, the inner walls and rim being mostly covered with forest. On the southern rim of the crater the Government of Tanganyika have erected very substantial and very comfortable rest houses. Having arrived at the Crater, one has several courses open. You can either visit the crater on foot and see the herds of game on its floor, you can spend your time in the forests looking for elephant and buffalo, both of which abound there, or you can make a detour by car on very indifferent tracks on the hot and waterless Serengeti Plains. I selected the first and the last. I had no desire to look for

elephant or buffalo in the impenetrable jungle of stinging nettle. We found the floor of the crater teeming with game, such as wildebeeste, zebra and gazelle. On the Serengeti Plains we saw giraffe, wildebeeste, zebra, gazelle, lion and hyaena.

On the rim of the crater we found a rich and luscious pasturage. The floor of the crater was covered with grass such as is found in semi-arid country.

From the Ngorongoro Crater we returned to the Great North Road, passed through Arusha and visited Kilimanjaro, the highest mountain in Africa—an extinct volcano, rising to 19,700 odd feet. We ascended the mountain up to 8,000 feet, but were prevented from going further owing to heavy rain and cloud. We were fortunate in obtaining a glimpse of this snow-capped mountain just before the sun set, on two evenings when we were camped in the plains of the Njeri desert some sixty miles away, and the sight was one not to be forgotten.

We reached the Kenya border in exactly a month from the time that we left Pretoria, and proceeded at once to Nairobi, which we reached the following day. One of the most pleasing sights of the whole trip was the herds of game on the Kapiti Plains before reaching Nairobi.

We spent four or five days in Nairobi meeting the principal people there and making plans for my tour through the colony. I was anxious to see as much of the country as possible, and the Kenya Government wanted me to see in particular their native reserves, the chief areas of white settlement, and their experimental stations. We spent in all five weeks in Kenya, and during this time visited all the chief parts of the country except the coastal belt. In the province of the Northern Frontier we visited Marsabit, and in the North-West we traversed the Turkana desert and inspected the southern and north-western shore of Lake Rudolf as far as the Sudan and Italian borders.

I was able by this means to get a good idea of the vegetation of Kenya and was able to map it. I found that more than one-third of Kenya Colony is desert country, i.e., country in which only roving native tribes with their flocks and herds can lead a precarious existence. Bordering the desert is a belt of semi-arid grassland country, in which most of the native reserves are situated. Next in size is an area of high-grass country occupied both by natives and Europeans. This includes the chief agricultural centres of activity in the colony, coffee, maize, wheat, sisal, stock and tea being produced.

Finally, in the centre are the highlands of Kenya, which have recently been set aside solely for European occupation. This consists of evergreen forest and evergreen pasture country, in which Kikuyu grass pastures probably form the finest natural pastures in the world. This is most attractive country and offers great possibilities for dairying, poultry and closer settlement.

I found the native reserves in Kenya situated in the semi-arid grassland belt in a very serious condition, and I attempted to get at the root cause of the trouble—severe soil erosion. Two factors can be said to be responsible for the serious state of affairs found :—

(1) Inability on the part of the country to assess the value of its natural pasturage in the life of its people.

(2) Lack of knowledge and understanding on the part of the people to make the correct use of their land.

My report on my observations in Kenya has been published by the Government of that country and need not be referred to here.

After leaving Kenya we visited the northern shores of Lake Victoria amid scenes of great beauty, then crossed Uganda to Mount Ruwenzori or the Mountains of the Moon. We crossed the northern shoulder of the Great Ruwenzori Range and then visited the Semliki Valley and touched the edge of the Great

Ituri Forest. We then traversed the western portion of Uganda and visited Lake George and Lake Edward, and the beautiful crater lakes Lutoto and Bunyoni in the high volcano country in the south-western corner of Uganda.

From here we passed into the Belgian Congo and visited the Parc National Albert, situated in the plains of the Great Rift Valley Mountains south of Lake Edward. From here we travelled to the northern end of Lake Kivu and then made a short detour into the Ruanda country, which is commonly regarded as the finest cattle ranching country in the world. Returning to Lake Kivu, we then travelled down the entire length of the western shore of Lake Kivu amidst scenes of the greatest beauty—brilliantly coloured vegetation on the lake shores on the one side and equally beautiful towering mountains rising up from the shores on the other.

At the north-western end of the Lake we passed over wide stretches of country which at no very distant date had been overrun by molten lava from the great volcano Nyamlagira, which we saw smoking in the distance, and little did we think at the time that within a couple of weeks of our passing over this country it would be laid waste again with molten lava from the same source.

From the town of Costermansville, at the southern end of Lake Kivu, we passed over the Great Rift Valley mountain range and descended into the valley of the Congo, amid luxuriant West African tropical vegetation and passed through a long stretch of West African equatorial forest, until we reached the Lualaba or Congo River at Kasongo. We then travelled some 130 miles up the valley of the Congo amid tropical forests of great beauty, crossed the Congo at Kongolo and ascended the high plateau country of the Province of Elizabethville, composed of parkland country with belts and patches of high West African tropical forest.

From Kabongo we emerged on the higher plateau country of the Belgian Congo bordering Northern Rhodesia. This was more open country with forest patches and riverine forests with a fine development of savanna trees, especially around Sungu. From here to Bukama, Jadotville, Elizabethville and Broken Hill we passed through dry woodland deciduous forest country in which *Brachystegias*, *Diplorrhynchus*, *Pterocarpus* and *Afzelia* took the place of the evergreen forest further north.

Thus, from the Limpopo Valley we passed over the lower plateau country of Southern Rhodesia, Mozambique and Southern Nyasaland. From here we traversed the high plateaux of Nyasaland and Northern Rhodesia, Tanganyika, Kenya and Uganda, then descended on to the lower plateaux of the Congo basin and finally crossed the high plateau country of the Belgian Congo and Northern Rhodesia.

CHAPTER 3.

The Climate.

The route traversed fell almost entirely within tropical and equatorial climates, but an amelioration of tropical conditions was largely brought about by the high altitude of the plateaux. In the south the tropical zone was charactertised by a marked dry season during the cooler half of the year and rainfall mainly in the form of heavy thunderstorms during the warmer months. In the equatorial zone two rainy seasons occurred with a short dry interval between.

CHAPTER 4.

The Vegetation.

Leaving the Northern Transvaal at the Beit Bridge on the Limpopo we crossed the south-eastern portion of Southern Rhodesia and travelled via Nuanetsi, Lundi, Zimbabwe and Birchenough Bridge to Umtali. This included much of the low-lying valleys of the Limpopo and Sabi Rivers with their tributaries, and the higher country around Zimbabwe and east of it, and also some high country south of Umtali. The low-lying country of the Limpopo and Sabi Rivers was covered with open mopane woodland in which *Adansonia*, *Balsamodendron*, *Sterculia*, *Kirkia*, *Afzelia*, *Acacia dulcis* and *Acacia pallens* characterised the vegetation (Pl. 1), while on the higher ground around Victoria

Plate 1.

open woodland of *Brachystegia randii* was associated with *Combretum*, *Bolusanthus*, *Uapaca*, *Faurea*, *Bauhinia*, *Podranea*, *Kigelia*, *Acacia*, *Burkea* and *Terminalia*. (Pl. 2.)

PLATE 2.

South of Umtali the valleys and hills were covered with open woodland of tall trees of *Brachystegia randii*. *Phoenix reclinata* and *Hyphaene* were common along the river banks. (Pls. 3 and 4.)

PLATE 3.

PLATE 4.

MOZAMBIQUE.

Entering Mozambique territory a few miles east of Umtali we travelled via Macequece, Vanduzi, Villa Guveia, Mungari and Tete to Blantyre in Nyasaland. This route traversed the plateau country of Mozambique bordering the north-eastern portion of Southern Rhodesia, the wide open low-lying valley of the Zambesi, where it separates Southern Rhodesia from the southern portion of Nyasaland, and finally the Kirk range of mountains where the Nyasaland

PLATE 5.

Plate 6.

border is encountered. The Mozambique plateau, which lies at an altitude of 2,000–3,000 feet, was covered with open *Brachystegia-Uapaca* woodland (Pl. 5). in which bamboo, tall Cymbopogons and tall Hyparrhenias, largely composed the ground cover (Pl. 6). Along the streams Raphia palm and elephant grass (*Pennisetum purpureum*) occurred (Pl. 7).

Plate 7.

Plate 8.

The Zambesi valley vegetation consisted of baobab, mopane, *Commiphora*, *Afzelia*, *Kirkia*, *Sterculia*, *Albizzia*, *Sclerocarya*, *Acacia*, *Combretum*, *Ficus sycamorus*, *Diospyros*, *Lonchocarpus*, *Zizyphus jujuba*, *Pseudocadia*, and *Tamarindus*. The grass cover was composed mainly of annuals (Pls. 8, 9, 10).

Plate 9.

Plate 10.

The Kirk range of mountains was clothed with open woodland of *Brachystegia-Uapaca* with bamboo thickets, and with associations of *Combretum*, *Terminalia* and *Protea* (Pls. 11 and 12).

Plate 11.

PLATE 12.

NYASALAND.

From Mwanza on the Portuguese–Nyasaland border we proceeded to Blantyre and Mount Mlange and then turned northwards to Zomba. From Zomba we travelled north via Liwonde, Ncheu, Dedza, Lilongwe, Kasungu, Mzimba, Fort Hill and Tunduma to Mbeya in Tanganyika.

From the hilly country of the Kirk range we descended into the low-lying valley of the Shiré River after first crossing the Wamkurumadzi River. The

PLATE 13.

PLATE 14.

vegetation in the Shiré valley consisted of *Adansonia*, *Kirkia*, *Afrormosia*, *Sclerocarya*, *Sterculia*, *Diplorrhynchus*, *Combretum* and *Acacia*. *Raphia* palms, *Phragmites*, elephant grass and *Echinochloa* clothed the river banks (Pls. 13, 14, 15, 16).

PLATE 15.

PLATE 16.

The plateau country around Blantyre was covered with *Brachystegia-Uapaca-Cussonia* woodland (Pl. 17) and the grass sward was composed mainly of tall Hyparrhenias, Cymbopogons and *Panicum maximum*. The low-lying plain surrounding the Mlange mountain was covered with tall grass in which there were scattered trees and bush. The grass consisted chiefly of Cymbopogons and elephant grass. The trees were composed of *Ficus*, *Bauhinia*, *Acacia*, *Kigelia*, *Trichilia*, *Strychnos* and *Syzygium*.

PLATE 17.

Plate 18.

In remnants of forest below Mlange, Raphia palms, tree ferns, *Anthocleista*, *Dracaena*, *Rauwolfia* and *Macaranga* were noted (Pl. 18). The Blantyre–Zomba plateau was covered with *Brachystegia-Uapaca-Cussonia* woodland and the Zomba mountain above 6,000 feet was clothed with mountain grassland with scattered tree and patches of temperate rain forest (Pls. 19 and 20).

Plate 19.

PLATE 20.

A short visit was paid to Lake Chilwa. The plain surrounding the lake was covered with tall grass, mainly *Cymbopogon*, *Hyparrhenia*, *Chloris*, *Themeda*, and *Digitaria*, in which scattered trees of *Acacia xanthophloea* and *Kigelia* were conspicuous (Pl. 22). Around the edge of the lake *Panicum repens* was the dominant grass, and was associated with dense growths of Cyperaceae. The hillside of a small island in the lake was studded with Adansonias (Pl. 21).

PLATE 21.

Plate 22.

On leaving the Zomba plateau for the north, by the Great North Road, we again traversed the wide low-lying valley of the Shiré River, where the vegetation was typical of that of tropical savanna-woodland (Pl. 23). It was composed of *Adansonia*, *Copaifera mopane*, *Kirkia*, *Dalbergia*, *Pterocarpus*, *Combretum*, *Sclerocarya*, *Terminalia*, *Bauhinia* and *Acacia*. *Borassus* and

Plate 23.

PLATE 24.

Raphia occurred in the swampy ground and *Zizyphus jujuba*, *Croton*, *Tamarindus*, *Acacia xanthophloea* and *A. albida* on the river banks. *Papyrus* and *Echinochloa* invaded the water's edge (Pl. 24) and were associated with luxuriant growths of *Nymphaea* and *Pistia*. The grass cover was dense and was made up mainly of *Pennisetum purpureum*, *Panicum*, *Chloris*, *Urochloa*, *Setaria* and *Rhynchelytrum*.

PLATE 25.

Plate 26.

On emerging from the Shiré valley the Great North Road, in its course through western Nyasaland, traverses a series of plateaux which are separated from one another by open plains draining eastwards to Lake Nyasa. The road traverses most of these plateaux with the exception of the high-lying Nyika plateau in northern Nyasaland, over whose lower south-western slopes it skirts. On proceeding northwards the first plateau encountered is that of the Dedza highlands, whose eastern portion was traversed between Ncheu and

Plate 27.

Plate 28.

Dedza and some fifteen miles beyond. These highlands lie approximately 5,000–6,000 feet above sea level and receive an annual rainfall of from 30–50 ins. There we spent the coldest night experienced on the expedition. The vegetation on the Dedza highlands was open grassland, merging here and there into orchard country or savanna. The grassland was composed mainly of tall *Themeda* and *Hyparrhenia*, with some *Trichopteryx* and *Andropogons* (Pl. 25). Bracken was common throughout the grassland. The low bush in the grassland of the

Plate 29.

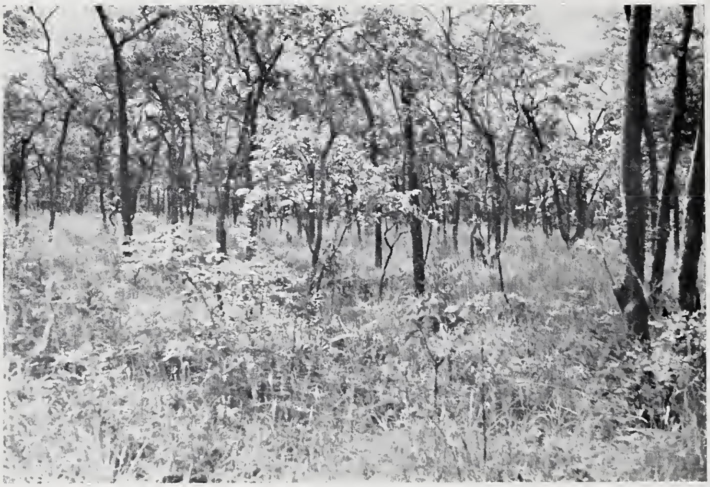

PLATE 30.

savanna was composed of *Parinarium*, *Uapaca*, *Dombeya*, *Cussonia* and *Erythrina*. The broken and hilly country on the plains south of Lilongwe was covered with *Brachystegia–Uapaca* woodland, and this type of vegetation continued until the Dowa highlands were crossed some 15 miles north of Lilongwe. Here the country was more open and the vegetation was typical savanna covered with tall Cymbopogons, in which there were scattered trees of *Acacia*, *Combretum*, *Erythrina* and *Pterocarpus* (Pls. 27, 28).

PLATE 31.

Plate 32.

North of the Dowa highlands the Kasungu plains, lying 3,000–4,000 feet above sea level, occupy a wide stretch of country and include the valleys of the Bua and Dwangwa Rivers with their main tributaries. This was covered largely by *Brachystegia-Diplorrhynchus* woodland, in which *Faurea saligna* was conspicuous (Pls. 29, 30). The grass cover in this woodland was mainly *Themeda* and *Hyparrhenia*. North of the Kasungu plains are the Mzimba highlands

Plate 33.

PLATE 34.

lying at an average height of 4,500 feet above sea level. These form the western shoulder of the higher Vipya plateau to the east. The Great North Road traverses these highlands for a distance of some 75 miles. The vegetation throughout was *Brachystegia-Berlinia-Uapaca* woodland with much *Protea hirta* (Pls. 31, 32). The grass cover was short and was composed mainly of *Themeda*, *Elyonurus*, *Setaria* and *Tristachya*.

PLATE 35.

PLATE 36.

North of the Mzimba highlands is a wide stretch of lower-lying country comprising, on the west, the plains of the South Rukuru and adjoining the plains of the Kasito River on the north-east. Our road traversed the Kasito plains, lying at an average elevation of 3,000–4,000 feet. The southern portion of these plains was composed of savanna country, in which *Acacia*, *Dichrostachys* and *Bauhinia* dominated, while the grass cover was largely made up of

PLATE 37.

PLATE 38.

Themeda, *Chloris gayana* and *Hyparrhenia* (Pls. 35 and 36). The country was thickly occupied by natives and considerably eroded, chiefly around Ekwendeni (Pls. 37 and 38). North of Ekwendeni and especially in the valley of the Kasito river, in the neighbourhood of its junction with the South Rukuru River at Njakwa gorge, the vegetation becomes more xerophytic and is of the savanna-thornland type, characterised by *Adansonia*, *Acacia*, *Zizyphus*, *Dichro-*

PLATE 39.

PLATE 40.

stachys, Pterocarpus, Combretum, Kirkia, Sclerocarya, Euphorbia (arborescent) and *Borassus* (Pls. 39, 40). The grass cover was particularly dense and rich and was composed of *Cymbopogon, Hyparrhenia, Themeda, Panicum, Urochloa, Chloris, Sorghum, Digitaria, Brachiaria, Setaria, Dactyloctenium* and *Pennisteum purpureum*, along the river banks.

In the valey of the Rukuru, below the southern foothills of the Nyika plateau, a wide belt of *Borassus* palm was encountered (Pls. 41, 42).

PLATE 41.

PLATE 42.

From the Kasito plains at Ekwendeni a short detour was made to the western shore of Lake Nyasa at Nkata Bay. In doing this, we crossed the northern edge of the high Vipya plateau and the southern end of the Kandoli mountains bordering the lake. The road over this stretch of country was extremely bad, and we were unfortunate in striking very heavy rain there. The region normally enjoys a summer rainfall of 60–70 inches and a winter

PLATE 43.

Plate 44.

rainfall of over 10 inches. The lower slopes (4,000–5,000 feet) of the Vipya plateau were covered with *Brachystegia-Berlinia-Uapaca* woodland in which the grass cover consisted mainly of a short low growing *Hyparrhenia cymbaria*. The trees in this woodland were festooned with long tresses of lichen, and the atmosphere was so damp and clammy that one had great difficulty in keeping

Plate 45.

Plate 46.

the lens of the camera free from moisture. The higher parts of the plateau (5,000–6,000 feet) consisted of open grassland of the mountain type, and of savanna in which scattered bush and trees of *Protea*, *Faurea*, *Cussonia* and *Parinarium* were conspicuous (Pls. 43, 44). The grass cover was comparatively short and dense, and consisted of *Themeda*, *Setaria*, *Paspalum*, *Andropogon*, *Elyonurus*, *Trichopteryx*, *Sporobolus* and *Eragrostis*.

Plate 47.

PLATE 48.

The eastern and lower slopes of the plateau were clothed with dense *Brachystegia-Berlinia-Uapaca* woodland (Pls. 45 and 46), while the low-lying (1,500–2,000 feet) valley of the Limpasa River was covered with high elephant grass. The escarpment of the Kandoli mountains bordering the lake had stretches of evergreen forest. Large trees of *Adansonia* and *Eriodendron* occurred on the edge of the fringing forest on the shore of the lake (Pls. 47, 48).

PLATE 49.

Plate 50.

After leaving Njakwa gorge and the valley of the Rukuru River the Great North Road skirts the south-western foothills of the Nyika plateau, enters Northern Rhodesia in the upper reaches of the Luangwa valley, then returns to Nyasaland east of the Mafingi Hills, and after passing through Fort Hill finally reaches Tandumo on the Tanganyika border. Most of the country traversed on this route lay at an altitude of 4,000–5,000 feet and consisted of open plains with gentle low-lying hills, and much of it was subjected to a rainfall

Plate 51.

PLATE 52.

of 60–70 inches. The vegetation throughout was high *Brachystegia-Berlinia-Uapaca* woodland with *Protea*, *Faurea*, *Parinarium* and *Burkea* associations (Pls. 49, 50, 51, 52). The grass cover was composed mainly of tall *Cymbopogon*, *Hyparrhenia*, *Pogonarthria* and *Themeda*. Along the streams *Rauwolfia*, *Syzygium*, *Trichilia*, *Raphia* and elephant grass were present (Pls. 53, 54), while in the high country east of the Mafingi Hills *Melinis minutiflora* and *Digitaria abyssinica* were observed.

PLATE 53.

Plate 54.

TANGANYIKA.

From Tundumo our route via the Great North Road lay through the Iringa, the Central and the Northern Provinces, and was a follows :—Mbeya to Iringa, Dodoma, Kondoa, Arusha, Longido and Namanga at the Kenya border. Three detours were, however, made from the main road. In the south we branched off at Mbeya and visited the eastern shore of Lake Rukwa. In the north we

Plate 55.

Plate 56.

left the main road to Babati, passed through the Mbulu country, visited the Ngorongoro Crater, and the Serengeti Plains and then returned to the Great North Road some fifty miles south of Arusha. From Arusha also we went to Moshi, ascended the lower slopes of Kilimanjaro, and then returned to the main road north of Meru, by the road which runs between Kilimanjaro and Meru.

Plate 57.

Plate 58.

In taking the above course we saw something of the Mbosi plateau, of the high mountain country between Mbeya and Lake Rukwa, of Lake Rukwa of the Poroto Mountains east of Mbeya, of the plains of the headwaters of the Great Ruaha River south of the Sao Highlands, of the Sao Highlands and the Iringa Plateau, of the valley of the Great Ruaha River, of the Dodoma–Kondoa Plateau, of the Mbulu Highlands, of the Ngorongoro Crater, of the Serengeti Plains, of the Masai Steppe east of Lake Manyara and south of Arusha, of the

Plate 59.

PLATE 60.

valley and plains of the Pangani River, of the lower slopes of Kilimanjaro, and of the Meru-Longido Plains.

THE MBOSI PLATEAU.

Between Tunduma and Mbeya is a high-lying, broken tract of country at 5,000–6,500 feet above sea level, which is the watershed between Lake Rukwa and Lake Nyasa. Towards the north-east the country falls steeply into the

PLATE 61.

Plate 62.

valley of the Songwe River south-west of the Mbeya mountain range. *Berlinia-Brachystegia* woodland covered the more broken country (Pls. 55, 56), while savanna in which *Parinarium* dominated clothed the more level and more open stretches (Pls. 57, 58). Tall Cymbopogons and Hyparrhenia were conspicuous in the grass cover. There was considerable native cultivation both on the hills and on the flats. Much drier conditions prevailed in the Songwe

Plate 63.

Plate 64.

valley, which was typical thorn country, composed largely of *Acacia* with a good grass cover of *Panicum*, *Chloris*, *Urochloa* and *Brachiaria* (Pls. 59, 60).

The Mbeya Mountain.

The road to Lake Rukwa from Mbeya traverses the north-eastern spur of the Mbeya Mountain, crosses the plateau country around Chunya, and then descends into the low-lying country between the Lupa valley and Lake Rukwa

Plate 65.

PLATE 66.

Mountain grassland characterised the north-eastern spur of the Mbeya Mountain, and in this grassland were patches of evergreen rain forest (Pls. 61, 62 63, 64). The grassland was made up chiefly of *Themeda*, *Trichopteryx* *Elyonurus*, *Digitaria*, *Hyparrhenia*, *Eragrostis*, *Sporobolus*, *Setaria*, *Andropogon*, *Ctenium* and *Rhynchelytrum*. At heights of 6,000–7,000 feet above sea level, Star grasses, Kikuyu grass, patches of elephant grass (Pl. 65), and stands of

PLATE 67.

PLATE 68.

Phoenix reclinata were observed. In the grassland at this altitude, white Delphiniums, tall scarlet Kniphofias and acaulescent Aloes were conspicuous, while on the edges of the forests tree Lobelias were seen for the first time (Pl. 66, 67). The lower slopes of the mountain merged from grassland into orchard country in which *Protea*, *Faurea*, *Dombeya*, *Combretum* and *Parinarium* composed the shrubs and trees (Pls. 68, 69) on the plateau around Chunya *Berlinia*-

PLATE 69.

Plate 70.

Brachystegia-Pterocarpus-Bauhinia woodland with tall Cymbopogons covered the land, and this woodland type continued almost to Lake Rukwa (Pls. 70, 71). Around the edge of the lake stands of Borassus palm, *Adansonia*, *Acacia albida*, *Acacia campylacantha*, *Tamarindus*, *Lonchocarpus*, *Thespesia* and *Ficus sycamorus* were noted, and associated with these was a dense undergrowth of *Chloris gayana* and *Panicum maximum* (Pls. 72, 73, 74). Along the edge of the lake a luscious growth of *Echinochloa* invaded the water and was often mixed

Plate 71.

Plate 72.

with a floating mass of *Pistia stratiotes* (Pl. 75). A flourishing dried fish industry was being carried on at the eastern end of the lake.

The Poroto Mountains.

East of Mbeya and separated from the Mbeya Mountains by a wide, flat, grass-covered valley lie the Poroto Mountains, the northern edge of which our road skirted. The foothills of these mountains were covered with savana

Plate 73.

Plate 74.

vegetation, while the higher reaches were clothed with mountain grassland and evergreen forest (Pls. 76, 77).

Great damage has been wrought both in the foothills and in the upper reaches of these mountains through erosion, and this is of such an extensive nature that it is conspicuous to the naked eye from a considerable distance. The savanna of the foothills was composed of tall grass of *Themeda*, *Setaria*, *Hyparrhenia*, *Cymbopogon*, *Eragrostis* and *Chloris*, in which trees and bush of

Plate 75.

Plate 76.

Dombeya, *Erythrina*, *Combretum*, *Protea*, *Faurea*, *Parinarium* and *Rhus* occurred. Conspicuous in this also were tall scarlet Kniphofias and white Delphiniums. The mountain grassland was composed chiefly of *Themeda*, *Elyonurus*, *Trichopteryx*, *Setaria*, *Ctenium*, *Eragrostis*, *Sporobolus*, *Andropogon* and *Hyparrhenia*, and on volcanic soils kikuyu grass was everywhere abundant and always closely grazed by stock (Pl. 78).

Plate 77.

Plate 78.

Bracken was also present throughout this mountain grassland. On the edges of the evergreen forest tree Lobelias again occurred, while here and there dense thickets of bamboo replaced the evergreen bush (Pls. 79, 80). A tall *Bromus* was also very common around the edges of the forest.

Plate 79.

PLATE 80.

PLATEAUX AND PLAINS OF THE GREAT RUAHA RIVER.

On leaving the Poroto Mountains we skirted the plateaux and plains at the headwaters of the Great Ruaha River. The plateaux were covered with open *Berlinia-Brachystegia-Uapaca* woodland and tall grass. In this woodland trees of *Acacia*, *Heeria*, *Adina*, *Bauhinia*, *Pterocarpus*, *Terminalia*, *Sterculia* and *Sclerocarya* were also present. The tall grass was chiefly composed of *Hyparrhenia* and *Cymbopogon* (Pl. 81).

PLAET 81.

Plate 82.

The plains consisted of a wide expanse of savanna thornland covered mainly by *Acacia*, *Commiphora*, *Dichrostachys* and *Adansonia* (Pl. 82). From the south-eastern edge of the Ussangu Plains at 5,000 feet we ascended the Sao Highlands at 6,000 feet and then traversed the plateau south of Iringa. This plateau forms the watershed between the Great Ruaha and Little Ruaha Rivers.

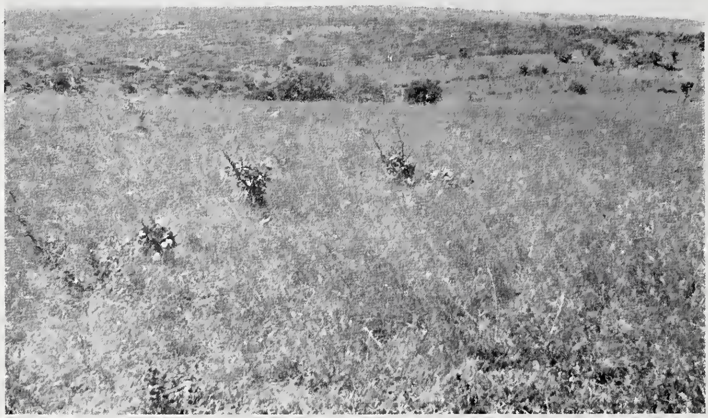

Plate 83.

PLATE 84.

THE SAO HIGHLANDS AND THE IRINGA PLATEAU.

On emerging from the plains a wide stretch of open grass and orchard country was passed over (Pls. 83, 84). The grass was chiefly *Themeda*, *Elyonurus* and *Brachiaria*. The bush was composed of *Parinarium*, *Pavetta*, *Tephrosia*' *Markhamia*, *Acacia*, *Vitex*, *Combretum* and *Dombeya*. After this a belt of open

PLATE 85.

Plate 86.

Berlinia-Brachystegia woodland occurred in which considerable gully erosion around Malangali was visible (Pls. 85, 86)..

North of this, as the 6,000 feet altitude was reached, the woodland gave way to open grassland and orchard country with isolated trees and trees in groups. The grassland was composed of *Themeda*, *Elyonurus* and *Trichopteryx* ; the bush and trees were mainly *Tecomaria*, *Protea*, *Faurea*, *Parinarium* and

Plate 87.

PLATE 88.

Dombeya. Before reaching Iringa the road descends into the valley of the Little Ruaha River. The northern slopes of the plateau facing the valley were covered with fairly dense *Berlinia-Brachystegia-Uapaca* woodland, while the Little Ruaha valley was thickly wooded thorn country (Pls. 87, 88) The hills and valleys immediately north of Iringa were clothed with tall *Berlinia-Brachystegia* woodland.

PLATE 89.

PLATE 90.

THE PLAINS OF THE GREAT RUAHA RIVER AND OF THE DODOMA-KONDOA PLATEAU.

Lying between Iringa and Kondoa are a series of plains occupying the valley of the Great Ruaha River in the south and in the north, abutting on to the south-western portion of the Masai Steppe as far as Kondoa. Between Dodoma and Kondoa the continuity is frequently interrupted by groups and chains of hills

PLATE 91.

Plate 92.

The greater part of this country is occupied by savanna thornland vegetation, in which *Acacia*, *Commiphora* and *Adansonia* dominate (Pls. 89, 90).

The grass cover is sparse, and it is in this area that all types of soil erosion can be seen in their most aggravated forms. North of Iringa the country is covered with dense impenetrable thorn thicket or thorn scrub composed largely of *Acacia* and *Commiphora* (Pl. 91).

Plate 93.

Plate 94.

In the valley of the Great Ruaha river open savanna-thornland of large *Acacia*, *Commiphora*, *Sterculia* and *Adansonia* trees occurs on alluvial ground stripped bare of its grass cover and top soil, but away from the alluvial valleys dense thorn thicket covers the plains. North of Dodoma dense thickets of *Dichrostachys* (Pls. 92, 93) suggest that they are now occupying much land

Plate 95.

PLATE 96.

that was originally under cultivation, but which has long since been reduced by man to barren desert. The hills lying in the thorn country between Dodoma and Kondoa were covered with *Berlinia-Brachystegia* woodland and their eroded nature was evidence of past dense native occupation. In this area relics of perennial grass, chiefly Star grass, were to be seen on ant heaps and under the shelter of thorn bush (Pls. 94, 95).

PLATE 97.

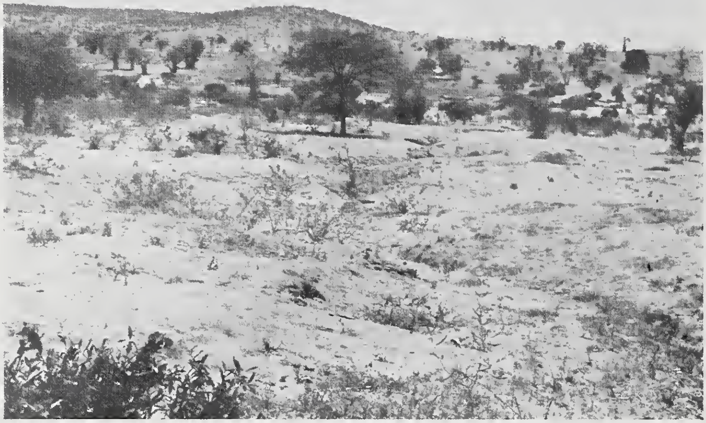

Plate 98.

High thorn country also occupied the valley of the Bubu River south of Kondoa (Pls. 96, 97).

The thorn country surrounding Kondoa, in which large *Adansonia* trees were conspicuous, was the worst maltreated land seen and had been practically ruined through cultivation and overstocking (Pls. 98, 99).

Plate 99.

PLATE 100.

THE KONDOA-UFIUME PLATEAU.

North of Kondoa the Great North Road traverses a stretch of high-lying country on the northern portion of which Mount Ufiume is situated, and from which a magnificent view of the Masai Steppe to the east can be obtained. This plateau was covered with high *Berlinia-Brachystegia* woodland and tall grass of *Hyparrhenia* and *Cymbopogon* (Pls. 100, 101). In this grass cover Kikuyu

PLATE 101.

PLATE 102.

grass occurred also, especially on the soils of volcanic origin. This part was densely populated and the natives were growing sugar cane, maize, kaffir corn, bananas and mangoes. On this plateau the *Berlinia* and *Brachystegia* trees were the largest seen throughout the trip (Pls. 102, 103)..

North of Berreku on this plateau the road descends into lower-lying and more open country around Babati, where the vegetation is open grass country

PLATE 103.

PLATE 104.

merging into orchard country. Large trees of *Acacia xanthophloea* fringed the swamps and small lakes in this area (Pl. 104), and large isolated trees of *Ficus* were conspicuous in the grassland (Pl. 105).

From Babati we struck westwards across the plateau by a track which took us to Ndareda, a small native village, and from here we travelled through the country directly below the steep eastern escarpment of the Mbulu highlands

PLATE 105.

Plate 106.

to the foot of Mount Hanang and to the shores of the salt lake north of Mount Hanang. From this point we climbed a rough track over the steep escarpment and reached the Mbulu highlands, and then passed through Dongobesh and Mbulu on our journey north to the Ngorongoro Crater area. Between Babati and Ndareda the vegetation was composed of savanna with *Protea* and *Dombeya*

Plate 107.

Plate 108.

in the grassland on the high ground (Pl. 106) and *Acacia* in the valleys (Pl. 107).

The grass cover was dense and consisted of *Themeda*, *Elyonurus*, *Tricopteryx*, *Setaria* and *Digitaria scalarum* on the high ground and of *Themeda*, *Panicum*, *Chloris*, *Eragrostis*, *Brachiaria*, *Hyparrhenia*, and stoloniferous *Digitarias*. Large herds of cattle were grazing on this fine pasturage on the open flats just

Plate 109.

PLATE 110.

below the Mbulu escarpment. The eastern slopes of the escarpment were covered with extensive patches of evergreen forest. North-east of Mount Hanang savanna vegetation was encountered in which large *Acacia* trees dominated (Pl. 108). On the eastern edge of the salt lake, dense *Acacia* thickets were present (Pl. 109).

PLATE 111.

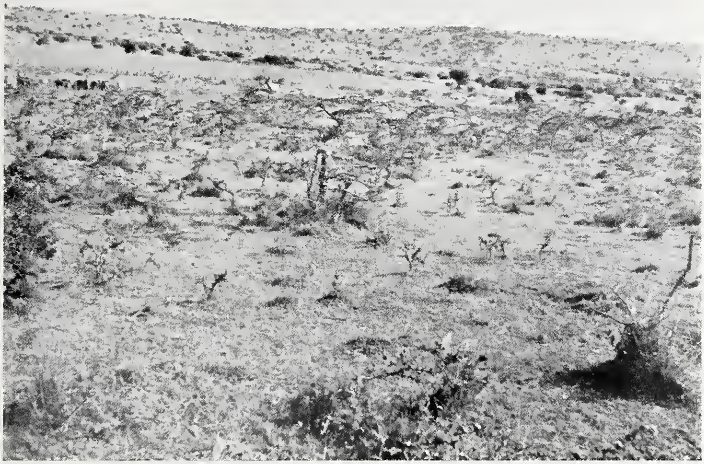

Plate 112.

The Mbulu Highlands.

Situated between Mount Hanang to the south, Lake Eyasi to the north-west, and the Ngorongoro Crater to the north, is a block of high-lying, undulating and rolling country at 6,000 feet above sea level—the Mbulu Highlands. In the south these highlands are open rolling grass steppe, but towards the north a certain amount of scattered bush has invaded the grassland and gives rise

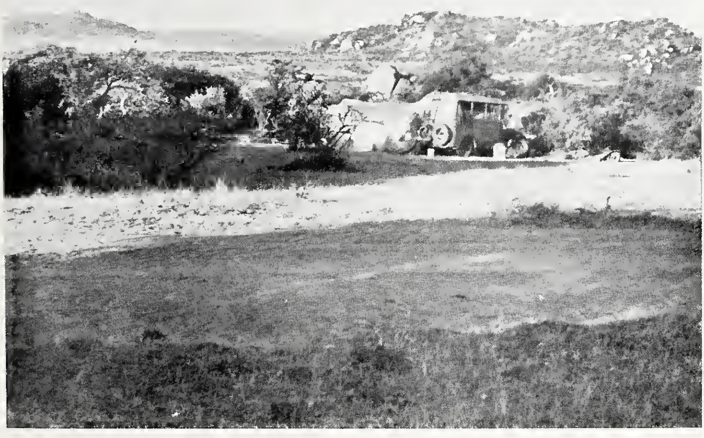

Plate 113.

Plate 114.

to open savanna (Pl. 110). The country is thickly populated by the Mbulu people, whose quaint flat-roofed huts at ground level are not easily discernible on the landscape (Pl. 111).

Large herds of cattle were everywhere to be seen. The grass cover was dense and short and consisted mainly of Kikuyu grass and *Digitaria scalarum*. Where heavy overgrazing had taken place, there *Acacia drepanolobium* was

Plate 115.

Plate 116.

taking possession of the land (Pl. 112). In the granite boulder country around Dongobesh bush covered the kopjies (Pl. 113). The bush was composed largely of *Rhus*, *Ormocarpum*, *Combretum*, *Acacia*, *Commiphora*, *Pavetta* and *Carissa*. North of Dongobesh the grass cover was made up largely of *Themeda*, Star grass, Rhodes grass and Kikuyu grass. The country had been very heavily stocked and there was little of it that had not been cultivated in the past. In

Plate 117.

Plate 118.

spite of this the pasturage on the Mbulu Highlands was of exceptional quality, and the cattle tracks on the hillsides bore witness to the heavy stocking that must have taken place in the past (Pl. 114). Throughout this area the roadside was frequently a matted turf of Kikuyu grass (Pl. 115).

North of Mbulu, the highlands peter out into an open and low-lying valley which separates them from the Ngorongoro crater massif. The vegetation

Plate 119.

PLATE 120.

in the valley was of the savanna type in which *Acacia drepanolobium* dominated. (Pls. 116, 117).

THE NGORONGORO CRATER MASSIF.

From the valley between Lake Eyasi and Lake Manyara the ascent from the south to the crater is at first gradual over the foothills at 4,000–5,000 feet,

PLATE 121.

Plate 122.

but after this it becomes steeper and steeper as the rim of the crater is reached at 8,000 feet. The foothills were covered with orchard and parkland country, in which there was a dense grass carpet of *Themeda*, Rhodes grass and Star grass. *Acacia* shrub and tree dominated the orchard and parkland country (Pls. 118, 119). From 6,000-7,000 feet above sea level the southern slope were covered with dense tropical bush and rain forest (Pls. 120, 121, 122, 123

Plate 123.

PLATE 124.

in which thickets of a robust stinging-nettle—*Urtica massaica*—made exploration and collecting very difficult and well-nigh impossible (Pl. 124).

On the edge of the bush herbaceous shrubs of Malvaceae and Labiatae were extremely common. On the top of the crater rim dense carpets of Kikuyu grass and white clover occupied the open spaces, and associated with these

PLATE 125.

Plate 126.

were coarse and rank growths of *Themeda*, *Cymbopogon*, *Eleusine Jaegeri* and *Pennisetum Schimperi* (Pls. 125, 126, 127).

We traversed the southern and the north-western portion of the south-western rim of the crater. The southern and south-western portions were for the most part covered with dense bush and evergreen forest, the north-western portion, however, bordering on the Serengeti plains, was grass covered, and there was an almost total absence of bush and tree in this section. The grasses here

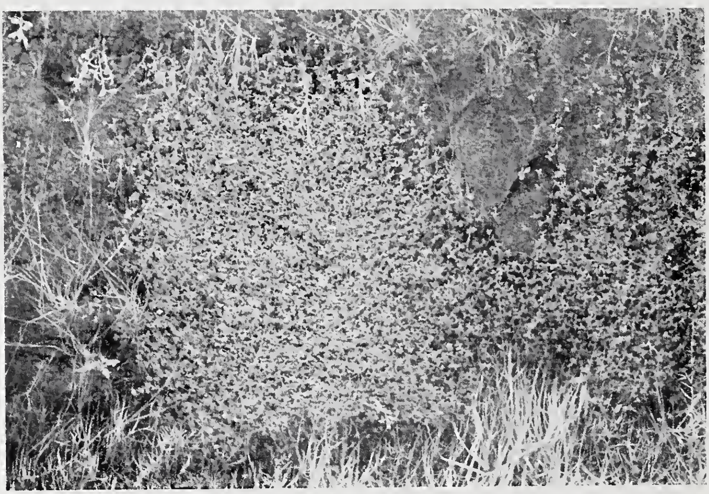

Plate 127.

PLATE 128.

were *Themeda, Andropogon, Digitaria, Cynodon*, Rhodes grass and Star grass. We made a visit to the floor of the crater from this short grass-covered section, and from this point it was possible to get a good general view of the whole of the interior of the crater, whose diameter is twelve miles. As far as we could see forest covered the southern, eastern and northern rim of the crater. Within the rim the northern and eastern slopes were also largely covered by forest, whereas

PLATE 129.

PLATE 130.

the western and southern slopes were mainly covered with grass, in which some bush was present (Pl. 128), while forest patches occurred in the deep ravines. There was also a large patch of forest on the floor of the crater at the south-eastern corner. The grass cover on the western and southern inner slopes was made up mainly of *Themeda*, *Cymbopogon*, *Andropogon*, *Digitaria* and Kikuyu,

PLATE 131.

Plate 132.

while the conspicuous trees and bushes were an arborescent *Euphorbia* (Pl. 129), a large *Synadenium* (Pl. 130), and *Lycium* bushes.

On the floor of the crater the chief grasses were *Themeda*, *Aristida*, *Digitaria*, *Andropogon*, *Chloris* and *Cynodon*. At the edge of the lake on the floor of the crater, *Sporobolus pungens* was the main grass.

Plate 133.

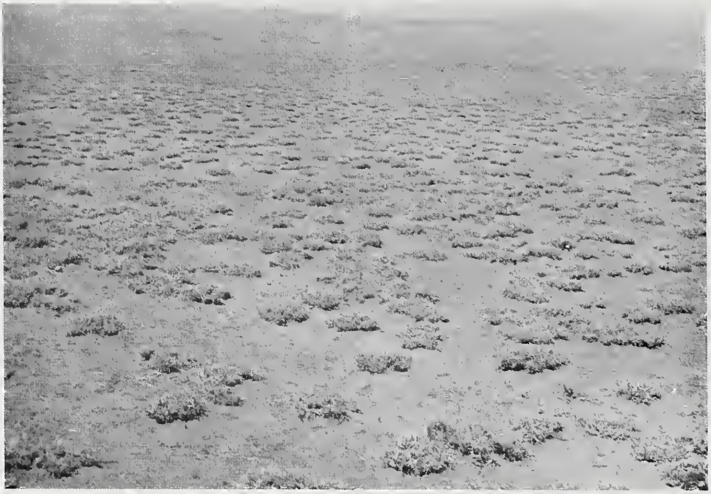

Plate 134.

The Serengeti Plains.

The Serengeti plains lie directly to the west and north-west of the Ngorongoro crater massif. They consist of flat open country lying at approximately 4,000–5,000 feet above sea level and are only broken in the north-east by isolated and scattered hills. From the Ngorongoro crater we made a short traverse through them along the eastern section, following roughly the track to Loliondo-

Plate 135.

PLATE 136.

The south-eastern portion of the plains bordering the Ngorongoro crater consisted of savanna in which gigantic *Acacia* trees dominated the landscape (Pls. 131, 132). These were associated with *Commiphora* and *Adenium* bush and tall *Sansevieria* thickets. The grass cover was mainly *Themeda*, *Digitaria*, *Chloris* and *Cynodon*.

PLATE 137.

PLATE 138.

The central portion of the plains consisted of open grass steppe of a much more zerophytic character. The grass cover was short and of the bunch type with wide open intervening spaces of bare ground (Pls. 133, 134). Herds of game, chiefly gazelle, were inhabiting these plains at the time of our visit.

PLATE 139

Plate 140.

Ngorongoro–Arusha.

From the crater we returned by the same track to the point where the road from Mbulu meets the road from Oldeani to Arusha, and this we then took to Arusha. For some fifteen miles the road traverses the plateau country south-east of the crater and then suddenly descends a steep escarpment into a low-

Plate 141.

PLATE 142.

lying valley in which Lake Manyara is situated. The road skirts the northern shore of the lake and then trends to the south-east to join the great north road, some fifty miles south-west of Arusha. From its point of intersection and to Arusha it traverses the north-western portion of the Masai Steppe.

The plateau country was covered with open savanna vegetation with scattered *Acacia* trees. The grass was composed mainly of tall *Themeda*, and

PLATE 143

Plate 144.

Rhodes grass and was green. In this grass cover sweet-scented white Delphiniums were in flower on the hill slopes on soils overlying a red volcanic lava (Pls. 135, 136).

The eastern slopes of the escarpment above Lake Manyara were covered with patches of evergreen forest and with deciduous *Berlinia-Brachystegia-*

Plate 145

PLATE 146.

Diplorrhynchus woodland, while the valley below was clothed with savanna thornland and open stretches of grassland (Pls. 137, 138).

The trees in the thornland were *Acacia*, *Commiphora*, *Sclerocarya*, *Adansonia*, *Euphorbia* and arborescent aloes. The grass was no longer green in the valley and was composed of *Themeda*, *Cenchrus ciliaris*, *Chloris gayana*, *Pennisetum massaicum* and *Eragrostis superba*. East of the Lake Manyara valley

PLATE 147.

PLATE 148.

lay the north-western portion of the Masai steppe. At first this was open thorn country of *Acacia drepanolobium* with a dense grass cover of *Themeda* and *Pennisetum massaicum*. Then on the higher level there were large stretches of *Themeda* with *Digitaria abyssinica* and Star grass on the open plains. Twenty miles west of Arusha savanna of *Balanites* in *Themeda* and *Pennisetum massaicum* grassland was encountered and this continued right up to Arusha (Pls. 139, 140.).

PLATE 149.

Plate 150.

From Arusha we took the main road which runs due north across the foot-hills of Mount Meru to Oldonyo Sambu. This was rolling hilly country covered with magnificent green grass, on which large flocks of goats and herds of cattle were feeding. The grass was mainly *Themeda* and Rhodes grass with a considerable amount of a yellow *Melilotus* in it (Pls. 141, 142). As we proceeded further north we got into drier country. The grass cover was shorter, sparser and was no longer green. It was made up largely of stoloniferous *Digitarias*,

Plate 151

Plate 152

with some *Themeda* and Rhodes grass in it. We camped fo: the night in this short, dry grass country at a point north-west of Mount Meru (Pls. 143, 144).

Just before sunset Kilimanjaro, which up to now had been completely enveloped in cloud, suddenly exposed its snow-capped peak for some ten minutes and presented a beautiful scene never to be forgotten. From our

Plate 153.

PLATE 154.

camp at this spot we had also a magnificent view of the vast plains of the Nyeri Desert to the north-east.

From this camp we returned to Arusha and proceeded eastwards to Moshi with the object of seeing something of the vegetation on Kilimanjaro. Nothing could be seen of the mountain, which was completely enveloped in heavy cloud From Moshi we went up the lower slopes of Kilimanjaro as far as 8,000 feet.

PLATE 155.

Plate 156.

but the heavy rain encountered at this altitude made any further ascent out of the question, so we returned to Moshi and then took the road which runs between Kilimanjaro and Mount Meru and eventually reached our camping site of the previous evening, just north-west of Mount Meru.

The Pangani River rises on the southern slopes of Mount Meru and Kilimanjaro and its main drainage area lies between Arusha and Moshi. East

Plate 157.

PLATE 158.

of Arusha the higher country is covered with dense tropical forest and bush (Pl. 145). This merges into parkland and then into a wide thorn belt with open grass plains around Sanya (Pls. 146, 147). Across the Pangani River the country becomes densely covered with tree, bush and tall grass, which extends right up to Moshi (Pls. 148, 149).

We found the lower slopes of Kilimanjaro and as far as we went up to 8,000 feet, wherever the bush or forest had been cleared, densely covered with Kikuyu

PLATE 159.

PLATE 160.

grass and white clover, which more often than not had been closely grazed (Pls. 150, 151).

Around Moshi Star grass was conspicuous. The southern portion of the country between Kilimanjaro and Mount Meru was covered with dense bush and forest patches and tall grass in which *Panicum maximum* was dominant. The northern portion was largely open grass steppe in which *Themeda* and *Digitaria scalarum* formed a dense growth (Pls. 152, 153).

PLATE 161.

Plate 162.

North of Mount Meru the country became much more arid, and *Acacia* and *Commiphora* bush covered the northern slopes and foothills. From Mount Meru camp at Oldoinyo Sambu we followed the Great North Road to Nairobi via Longido, Namanga and Kajiado. The road traverses the plains of the Nyeri desert and then climbs up on to the Kapiti plains and Athi plains before reaching Nairobi. The plains of the Nyeri Desert through which we passed

Plate 163.

Plate 164.

were covered with a short stoloniferous *Digitaria* in which *Acacia* and *Balanites* occurred (Pls. 154, 155). Thickets of *Acacia seyal* were frequently present in places where storm water lodged (Pl. 156). Just before reaching Longido, bushes of a large flowering white *Ipomoea* formed a striking feature along the roadside (Pls. 157, 158).

At Namanga we got into elephant country in the dry river valley where

Plate 165.

Plate 166.

there were large flat-topped Acacias and tall *Panicum maximum* grass (Pls. 159, 160). From here we passed through some beautiful *Themeda* country grading into savanna with Star grass and Rhodes grass. The trees composing the savanna were *Erythrina*, *Acacia* and *Balanites* (Pls. 161, 162).

The Kapiti plains (Pls. 163, 164) were covered with dense *Themeda* grass on which herds of game were feeding.

Plate 167.

Plate 168.

Nairobi.

Nairobi is situated at 5,500 feet and is just in the transition zone between the thorn country and the evergreen and deciduous parkland country. It lies in a rainfall belt of 30–40 inches. From Nairobi we took the road to Mount Kenia via Thika, Fort Hall, Nyeri, Nanyuki to Meru. The road passes between Mount Kenya and the Aberdare range, and skirts the upper eastern reaches of the Waso Nyiro valley. Our route passed through the Kikuyu Reserve

Plate 169.

7152–4

PLATE 170.

between Fort Hall and Nyeri. On of the most striking features between Thika and Nyeri was the series of large papyrus swamps. It was tall grass country, carrying Cymbopogons and Hyparrhenias with scattered bush and tree. Other conspicuous grasses were Star grass, Kikuyu grass and *Digitaria abyssinica*. In the Kikuyu country, just before reaching Nyeri in the Kikuyu country, there were wonderful Kikuyu grass and clover pastures, and I regarded this as one of the best parts of Kenya.

PLATE 171.

Plate 172.

From Nyeri I made a detour into the Aberdare range and saw some magnificient Kikuyu and clover pastures in the forest country (Pls. 165, 166, 167, 168.).

After leaving Nyeri the country became much drier and we passed over open grass plains until we reached Nanyuki (Pls. 169, 170). From Nanyuki we passed through belts of cedar forests on the northern foothills of Mount Kenya. Many of these cedars had died back from the tops (Pls. 171, 172).

Plate 173.

There was evidence of much past erosion in this country and in these open cedar forests, and I was of opinion that these trees had died back as a result of past overstocking and overgrazing which had taken place there and which had brought about a lowering of the water table.

Just before we reached Meru we passed again through native territory where much destruction of bush and high forest had taken place. We also passed through a narrow belt of high mountain forest, in which gigantic trees of *Vitex keniensis* and *Fagara macrophylla* (Satin wood) were conspicuous (Pls. 173, 174, 175).

PLATE 174.

Plate 175.

From Meru we made a short detour southwards on the Embu road so as to get an idea of the Eastern foothills of Mount Kenia. Much of the original bush and forest had been destroyed and the mountain slopes were covered with tall brackern fern with scattered bush and tree (Pls. 176, 177). The dominant grass on the roadsides was *Digitaria abyssinica*. From Meru our next objective was Isiolo and Marsabit in the Northern Frontier Province. We returned over part of the road that we had traversed the previous day, and passed through the belt of Mountain Forest and some cedar forest into open grassland, grass

Plate 176.

with whistling thorn, other Acacias and Balanites, and then reached Isiolo. From Isiolo to Marsabit the country was typical desert thornland with *Hyphaene coriacea* in the dry river beds (Pls. 178, 179). A tall much-branched *Adenium* was conspicuous on the stony or rocky outcrops, and a large purple fruited *Terminalia* formed dense thickets in the driest parts of the desert (Pls. 180, 181, 182).

Plate 177.

Plate 178.

After crossing the dry bed of the Merile River and passing through Laisamis we traversed a wide stretch of flat open country south of Marsabit where desert conditions were extreme. There was practically no cover to the soil over extensive areas, beyond isolated thorn trees, and scattered clumps of *Terminalia* bush (Pls. 183, 184). In this part of the desert, we came across, for the first time, plants of *Caralluma retrospiciens*, which were in flower (Pl. 185). *Acacia*

Plate 179.

Plate 180.

bush and *Hyphaene coriacea* lined the banks of the dry Merile stream bed (Pls. 186, 187).

As Marsabit was approached thorn country and grass became more conspicuous, while the higher parts of the mountain were clothed with evergreen mountain forest on which long tresses of bright yellow-green lichens were a marked feature from the distance (Pls. 188, 189, 190, 191). We had allotted a day for

Plate 181.

Plate 182.

the examination of this forest, but unfortunately we encountered very heavy rain in it and were compelled to abandon the project. From Marsabit we returned to Isiolo.

From Isiolo we travelled over the lower northern foothills of Mount Kenya to Nanyuki and then crossed the wide valley of the Waso Nyiro River to the northern end of the Aberdare range and camped just outside Thomson's Falls on the north-eastern slopes of the Aberdare Range.

Plate 183.

Plate 184.

The country between Isiolo and the northern foothills of Mount Kenia consists of open grass plains with scattered thorn (*Acacia*) and trees of *Balanites*. The grass cover was made up mainly of *Themeda*, *Pennisetum massaicum*, a stoloniferous *Digitaria* and *Chloris*. *Acacia xanthophloea* occurred along stream banks and around open vleis. The lower slopes of Mount Kenia carried a parkland vegetation characterised by the presence of the Pencil Cedar or East African Juniper, one of the commonest trees in the Kenya highlands and at the same

Plate 185.

PLATE 186.

time the world's largest juniper (*Juniperus procera*). This part of the country bore evidence of much past erosion and the state of the cedar forests some twenty-three miles north-east of Nanyuki was an object lesson on the detrimental effects which overgrazing of the pasturage can have on the health of forest trees. Most of the trees in this area give one the impression that in some time past they had been struck by some serious disease. The tree tops are mainly affected and the trees wither and die from the tops downwards. This

PLATE 187.

Plate 188.

trouble I found was largely regarded as being due to the effects of fire, and even the local forest officer held this opinion. There is little doubt in my own mind that it was due to the destruction of the grass cover below through overgrazing and to the subsequent desiccation of the soil. From Nanyuki we crossed the wide open valley of the Waso Nyiro River. This consisted of open short grass country and a vast expanse of *Acacia* savanna, where black friable soils were particularly common. Dense patches of whistling thorn and other *Acacias*

Plate 189.

PLATE 190.

left little doubt that much of this country had at no very distant time been heavily overstocked (Pls. 192, 193).

After crossing this valley we emerged on to the north-eastern foothills of the Aberdare range and immediately a striking change in the vegetation was encountered. We suddenly came on to evergreen shrub and cedar forest country. It was composed of patches of cedar forest with open grass glades

PLATE 191.

Plate 192.

(Pls. 194, 195). Kikuyu grass was invading roadsides with a bright green velvet carpet and made a beautiful sight, in striking contract to what we had passed through during the previous days (Pls. 196, 197).

This type of country continued right up to Thomson's Falls, which are situated on the northern end of the Aberdare Range. We spent the next few days in the highlands of Kenya, and traversed the northern portion of the Aber-

Plate 193.

Plate 194.

dare Range, a portion of the Rift Valley between the Aberdare Range and the Mau Range (southwards as far as Nakuru and northwards as far as Lake Hannington). We crossed the Mau Range from Ravine to Londiani and then travelled along its north-western slopes to Kericho. From Kericho we examined the country on the south-western slopes of the Mau range, in the neighbourhood of Chemagel and Sotik Post. From here we returned to Londiani and traversed

Plate 195.

PLATE 196.

the western edge of the highlands formed by the Elgeyo escarpment and the Cherangani Mountains. From Kitale we also visited the eastern slopes of Mount Elgon.

PLATE 197.

Plate 198.

THE HIGHLANDS OF KENYA.

The Aberdare Mountains.

The vegetation of the northern portion of the Aberdare Mountains in the neighbourhood of Thomson's Falls at an altitude of 7,700 feet consists of mountain forests and open grassland. The chief constituents of the forest were the East African Juniper or Pencil Cedar, *Podocarpus gracilior*, and the East African

Plate 199.

Plate 200.

Olive (*Olea Hochstetteri*) with thickets of Wych-hazel (*Trichocladus malosanus*) (Pls. 198, 199). The grass was composed mainly of *Themeda*, *Setaria* and *Pennisetum*, but in this Kikuyu grass formed dense mats on termite heaps and invaded the roadsides (Pls. 200, 201). In this vicinity it was very striking to see how all grass growing on termite heaps was closely grazed in preference to that anywhere else. The richest flora yet seen was noticed in this cedar forest

Plate 201.

PLATE 202.

country, and it was also noted that the natural Kikuyu grass pastures carried a wealth of herbaceous legumes. In the low-lying vlei country between Thomson's Falls and Nakuru magnificent natural pastures of Kikuyu grass and clovers were observed (Pls. 202, 203). On the shallower soils in this vicinity a very showy *Craterostigma* grew in profusion and was in flower. Further southwards on the western slopes of the Aberdares *Andropogon chrysostachyus*

PLATE 203.

Plate 204.

frequently became dominant and at 9,000 feet we passed through a broad belt of high Bamboo forest in the grassland (Pls. 204, 205). At this altitude *Digitaria scalarum* took possession of the roadsides. Just before emerging on the Rift Valley at Nakuru we passed through tall cedar forests with tall Cymbopogons below and festoons of dense creepers in the trees. Along the roadsides large

Plate 205.

Plate 206.

deep orange-flowered Thunbergias and bright scarlet Gloriosas lent colour to the scene.

The Great Rift Valley.

Our acquaintance with the Great Rift Valley in Kenya was confined to that portion of it which lies between the Aberdare Mountains and the Mau Range, southwards as far as Nakuru and northwards as far as Lake Hannington

Platz 207.

PLATE 208.

and Embagong in the Kamasia Reserve. The higher southern portion falls within the Kenya highlands and is a rich agricultural area where intensive farming operations are carried on by the European population, while the lower northern portion is occupied by the Kamasia tribes. The country consists of wide open plains and plateaux, covered with tall oat grass (*Themeda*) (Pl. 206). The south-western portion abutting on the foothills of the Mau range frequently

PLATE 209.

PLATE 210.

consists of tall *Acacia* savanna country (Pls. 207, 208) while on the red Rongia soils dense bush of *Acacia*, *Tarchonanthus* and *Rhus* occurs. Around Lake Solai dense thorn thickets and high *Combretum* bush are found (Pls. 209, 210) The lower and drier parts to the north are typical thorn country in which *Acacia* and *Balanites* trees dominate.

The grass cover or natural pasturage in this area is probably some of the

PLATE 211.

PLATE 212.

best in Kenya. Tall oat grass (*Themeda*) dominates the southern portion, and on the flanks of the Aberdale Mountains and Mau Range it is associated with tall Hyparrhenias and Cymbopogons. Around Lake Solai and further north Star grass (*Cynodon plectostachyum*) assumes dominance. The dry floor of Lake Solai is covered with almost a pure stand of Star grass in which a number of herbaceous legumes were noted (Pls. 211, 212). Rhodes grass and

PLATE 213.

Plate 214.

Kikuyu occur throughout the grass cover in the higher parts, and with Star grass these frequently take possession of the roadsides. The tall oat grass when disturbed in this area gives way to Rhodes grass, and heavy grazing reduces the grass cover to Star grass pasturage. On the northern shore of Lake Nakuru the vegetation was very sparse. The first growth encountered from the water's edge was a belt of *Juncus* sp., then behind this a strongly

Plate 215.

PLATE 216.

stoloniferous *Sporobolus* (Pl. 213). After this a dense mat of Star grass, Rhode grass and Kikuyu occurred. Behind this again were high thickets of *Acacia xanthophloea* bordered with *Hyparrhenia hirta*.

The hills in the Kamasia country wre covered with bush made up mainly of *Acacia arabica*, *Acacia* spp., *Dichrostachys glomerata*, *Croton dichogamus* *Grewia bicolor*, *Grewia* spp., *Gymnosporia* sp., *Commiphora* sp., *Tarchonanthu*

PLATE 217.

Plate 218.

camphoratus, *Combretum* spp., *Boscia* spp., and *Balanites aegyptiaca.* The outstanding feature throughout this portion of the Rift Valley was the prevalence of Star grass. The Agricultural Officer in charge of this area informed us that these Cynodons were most valuable for restoring fertility to cultivated land.

Plate 219.

PLATE 220.

THE MAU-ELGEYO-CHERANGANI MOUNTAIN SYSTEM.

Lying between the Aberdare Mountains and Lake Victoria is an elongated mountainous block of country about 200 miles in length and from 30–50 miles in breadth. It is separated from the Aberdare Mountains on the east by the Great Rift Valley. It is made up of three mountain systems—the Mau Range, the Elgeyo escarpment, and the Cherangani Mountains to the north. The

PLATE 221.

PLATE 222.

higher portions of this mountainous system are composed of open grassy country, while the upper and lower slopes are forest clad. Bamboo forests occur from 10,000 feet to 7,500 feet, and below this cedar forests with *Podocarpus*, East African olive, and many other fine timber trees clothe the slopes. The northern portion of the Mau Range was traversed from Ravine to Londiani, to Lumbwa and to Kericho while the western edge of the range was skirted

PLATE 223.

Plate 224.

from Kericho to Chamagel and thence to Sotik. The southern portion of the Elgeyo escarpment was traversed between Timboroa and Eldoret, while a detour to the Cherangani Mountains was made on our way to Kitale.

The north-eastern slopes of the Mau Range from Ravine to Londiani were covered with high cedar forests, amongst which occur wide open grassy spaces. Masses of dense Kikuyu grass occurred around the edges of the forest and the open grass slopes were thickly dotted with bright green Kikuyu-clothed termite heaps. Star grass and *Digitaria abyssinica* also occurred throughout the grass cover. On the high plateau above the slopes forest and open grassland again

Plate 225.

occurred. But here, surrounding the edge of the forest, patches of a tall flat-topped Acacia (*A. lahai*) were conspicuous, while the roadsides were carpeted with bright green Kikuyu grass in which clover was plentiful. Throughout this high country *Themeda* was the dominant grass in the undisturbed veld and associated with it were *Heteropogon contortus*, *Pennisetum glabrum*, *Hyparrhenia* spp. and *Setaria* spp. In the high country around Lumbwa blue and green flowered Delphiniums were conspicuous in the grassland.

Plate 226.

Plate 227.

The north-western portion of the Mau Range from Lumbwa to Kericho consists of open grassland country with scattered tree and bush (Pl. 214) and with forest patches in the valleys, in which *Dracaena fragrans* occurred (Pl. 215). Conspicuous on the edge of this forest was *Impatiens elegantissima* (Pl. 216).

The grass cover was composed mainly of *Themeda*, *Hyparrhenia*, *Cymbopogon* with a close undergrowth of Kikuyu grass, *Digitaria abyssinica* and a small

Plate 228.

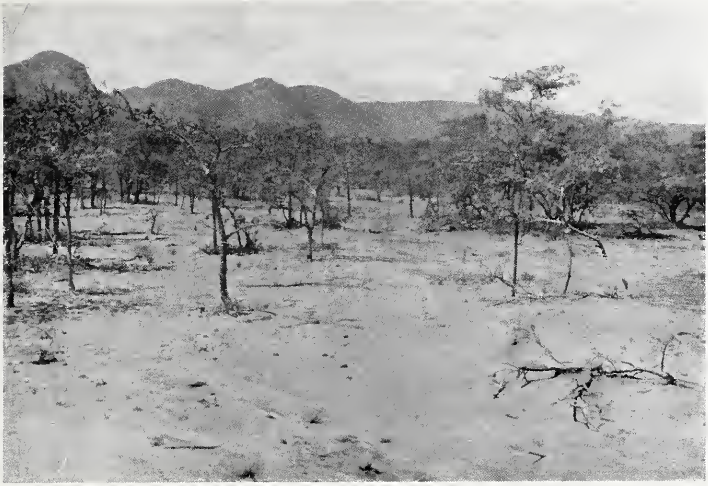

Plate 229.

Paspalum. Kikuyu grass invaded the roadsides almost throughout. In the grass here a striking species of *Pentas* was plentiful (Pl. 217). Between Kericho and Chemagel, which is the chief centre for tea cultivation in Kenya, a different type of vegetation was encountered. It approaches that of semi-tropical rain forest. Dense forests with lianes and *Anthocleista keniensis* occurred in the valleys, while tall bracken with rapidly growing bush and climbers covered

Plate 230.

PLATE 231.

the land. *Cassia didymobotrya*, *Vernonia Holstii* and *Solanum* bush characterised this type of vegetation. Between Chemagel and Sotik islands of bush were scattered through the grassland and this merged into typical savanna country (Pls. 218, 219). At Sotik particularly fine specimens of the flat-topped *Acacia campylacantha* added to the picturesqueness of the landscape (Pls. 220, 221).

PLATE 232.

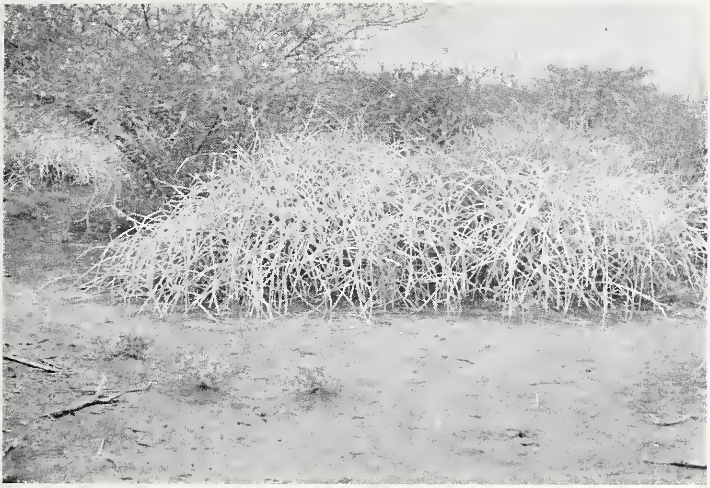

PLATE 233.

THE ELGEYO ESCARPMENT.

A narrow belt of cedar forest covered the higher parts, while the western slopes below consisted of fine attractive orchard country with large scattered trees. On the plains before reaching Eldoret the grass cover was made up mainly of *Themeda* and *Setaria* with Kikuyu grass and *Digitaria abyssinica* below. The plains were dotted with large and small termite heaps, most of

PLATE 234.

PLATE 235.

which were densely grassed over with Kikuyu. Kikuyu grass was also invading the roadsides here and forming dense green carpets. Between Eldoret and Kitale the vegetation was typical open savanna country in which trees and bush of *Ficus*, *Kigelia*, *Bauhinia*, *Thonningii*, *Erythrina tomentosa*, *Heeria reticulata*, *Vangueria linearisepala*, *Rhoicissus erythrodes*, *Combretum* and *Olea* occur in grassland of *Hyparrhenia*, *Themeda*, *Setaria* and *Brachiaria brizantha*

PLATE 236.

PLATE 237.

(Pls. 222, 223). Along the roadsides Star grass, Kikuyu and Rhodes grass were conspicuous after the Nzoia River had been passed.

At this river we came across the Giant Star grass for the first time, and soon afterwards it became quite plentiful and frequently had taken possession of and completely covered over large termite heaps.

PLATE 238.

PLATE 239.

THE CHERANGANI MOUNTAINS.

High cedar forests with *Podocarpus* and *Olea Hochstetteri* also occurred on the upper slopes of these mountains. The forests were fringed with fine flat-topped *Acacias*, and spacious grassy glades were intermingled with them. The grass cover was composed mainly of a tall *Themeda*, with which Kikuyu grass occurred. Attractive savanna country was found on the lower slopes in which trees of *Acacia*, *Erythrina*, *Protea*, *Faurea saligna*, *F. speciosa* and

PLATE 240.

PLATE 241.

Combretum were conspicuous. Along the stream banks in this area, *Phoenix reclinata* and *Salix Hutchinsii* were noted.

MOUNT ELGON.

From Kitale a brief visit to Mount Elgon was made and the eastern slopes up to 8,000 feet were inspected. Open orchard country occurred up to the

PLATE 242.

PLATE 243.

lower foothills, while on the lower slopes bush and tree growth increased in density with altitude. At 8,000 feet semi-tropical forest with cedar and *Podocarpus* occurred (Pls. 224, 225). On the lower slopes tall Cymbopogons, Hyaprrhenias and *Themeda* were the chief constituents of the grass cover, while Kikuyu-grass was everywhere abundant. On the open plain below *Themeda*, Rhodes grass, and Star grass dominated the grassland. Star grass clothed the road-

PLATE 244.

Plate 245.

sides and was especially conspicuous on the termite heaps. Many strains of Giant Star grass also occurred here (Pls. 226, 227).

The Turkana Country.

The Turkhana country was visited fiom Kapenguria. From here we travelled to Lodwar, south-west of Lake Rudolf, and then traversed the desert country of North Turkana to Lokitaung and Todenyang at the north-western

Plate 246.

Plate 247.

end of the Lake. On our return we visited Ferguson Bay on the south-western shore of Lake Rudolf. From Kapenguria the road turned west and descended a steep escarpment into the country of the West Suk. From here it proceeded for about 90 miles along the Turkana escarpment, which is the watershed of the Turkana country to the east in Kenya and of the Karamoja country to the west in Uganda. After reaching the Cheremungit Hills the road descended a second steep escarpment on to the Turkana desert below.

Plate 248.

PLATE 249.

The Turkana escarpment was covered with fairly dense bush composed of *Acacia*, *Dichrostachys*, *Ormocarpum*, *Commiphora*, *Xanthoxylon*, *Balanites*, *Grewia*, *Sclerocarya*, *Terminalia*, *Ximenia*, *Croton*, *Asparagus*, *Barleria*, *Solanum* and *Sansevieria* (Pl. 228). Relics of *Themeda* and *Panicum maximum* were seen under the protection of thorn bush, and the presence of considerable erosion left little doubt that the original grass cover had been eaten out (Pls. 229, 230). Its place was taken by a small annual purple *Sporobolus*. *Gloriosa* and *Craterostigma* were both frequent in this bush country. This country at one time had undoubtedly been very fine ranching country.

The north-eastern face of the Cheremgunit Hills, where the road descends the second escarpment on to the plains of the Turkana desert, was well covered with tree and bush amongst which tall arborescent *Euphorbias* were conspicuous. At this spot also fair-sized trees of *Poinciana elata* were in flower (Pl. 231).

On the desert plains below, thorn bush (*Acacia* spp.), *Adenium*, *Adenia*, *Capparis*, *Sansevieria* and *Sarcostemma* formed a low scrub (232, 233, 234), while *Tribulus* was frequent throughout. The dry river banks were lined with tall *Acacia* trees and spreading bushes of *Salvadora persica* (Pl. 235). The desert country below the western escarpment was characterised by tall funnel-shaped termite heaps 15–20 feet high, while grass was practically non-existent throughout the North Turkana (Pls. 236, 237)

At Lodwar the Turkwel River was in full flood, and was a roaring muddy torrent (Pl. 238). A sample of the flowing water taken at this spot revealed that it was carrying 9 lb. of silt to every 100 gallons of water. Around Lodwar the hills were bare and barren, while isolated and scattered thorn bush occurred on the plains around. The plains lying between Lodwar and the Anglo-Egyptian Sudan boundary west of Lake Rudolf were even more desert-like in character than the country to the south. Vast stretches were devoid of vegetation (Pls. 239, 240), while elsewhere only scattered thorn bush was to be seen (Pls. 241, 242).

Plate 250.

Lake Rudolf.

The lake was visited at two points. First, the north-western shore, approaching it from Lokitaung, the military station of the King's African Rifles, which lies at the south-western end of the Labur Range. The lake was reached from Lokitaung by travelling down a dry river bed buried in a steep rocky gorge for a distance of some eight miles. From here we emerged on to a plain with scattered thorn bush and numerous small dry river beds (Pls. 243, 244). After crossing this plain and turning northwards we entered a great flat open plain devoid of trees and bush, but sparsely covered with low shrub and *Sporobolus spicata* (Pl 245). This plain showed clearly a number of different shore levels and continued like this for a distance of some 22 miles right up to the Anglo-Egyptian Sudan and Abyssinian borders, where it was broken by the entry of the Kibish River into the lake. At this point there was no well-defined river bed, but merely a low-lying open swamp covered with tall *Cyperaceae.*

The lake shore was covered with a fine sandy and muddy silt which, as the day wore on and as the wind got up, was being blown inland by a strong south-easterly wind and was forming a series of sand dunes on the old original lake shores (Pls. 246, 247). These dunes were frequently being colonized by *Sporobolus spicata.* The colour of the water in the lake here was a rich reddish-brown.

We returned to Lokitaung by the same route, viz., the dry river bed which runs through a steep rocky gorge. The vegetation in the gorge consisted mainly of large *Acacia* trees along the edges of the river and *Acacia* bush on the rocky slopes with isolated *Boscia* trees and some large *Adenias* (Pl. 248). On returning to Lodwar the lake was visited for the second time at the place known as Ferguson Gulf. The country lying between Lodwar and Ferguson Gulf was flat low-lying territory which is probably subjected to inundation when the Turkwel River in flood East of Lodwar the plains were bare and barren, excepting for some *Salvadora* bush. From here the country became

Plate 251.

more and more desert-like as the lake was approached. At first the plains had isolated bushes of *Asclepias* and then as we approached still nearer to the lake scattered *Acacia* bush was thu sole occupant of the desert (Pls. 249, 250). As the valley of Kaliolokwel River which opens into the northern end of Ferguson Gulf was approached vast stretches of dead and dying *Acacia* trees were encountered, and presented a piteous sight (Pls. 251, 252). They suggested that they had been struck by some terrible calamity, and so they had. There is very little

Plate 252.

PLATE 253.

doubt that they had been struck by man-made drought and the subsequent lowering of the water table. The stretch of country from Lodwar to Ferguson Bay, as well as the whole of the Turkana country that was traversed, bore unmistakeable evidence of having been heavily punished by the tramping and grazing of man's flocks and herds, and then it had been still further ruined by the rigours of the climate.

PLATE 254.

PLATE 255.

A dense belt of *Borassus* palm was occupying the banks of the dry Kaliolokwel River near its outlet into the lake and a few scattered xerophytic shrubs, but apart from this the soil was bare and barren (Pl. 253). Just before reaching the Gulf a stretch of swampy country was encountered which extended down to the shore. This was occupied by scattered *Borassus* palm, a tall *Eragrostis*, a dense growth of a tall *Cyperus*, and fringing growth of *Sporobolus spicata* and

PLATE 256.

PLATE 257.

Panicum repens. As before the water in the lake was a dirty reddish-brown colour. Wild-fowl of every description were frequenting the shore of the gulf.

WEST SUK.

On our return to Kapenguria a short visit was made to the Suk Reserve below Kapenguria. This entailed a descent from 8,000 feet to 5,000 feet down the northern slopes of the West Suk Hills, which can be regarded as northern

PLATE 258.

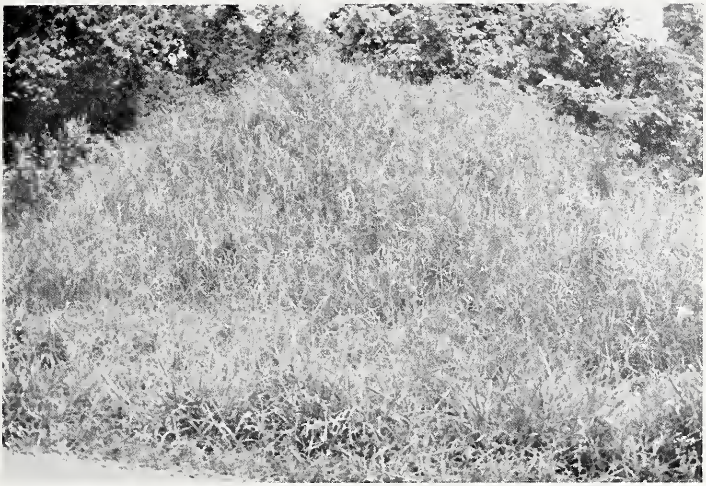

PLATE 259.

outliers of the Cherangani Hills. In this descent woodland, grassland and desert were encountered. On the plateau at Kapenguria open woodland country with flat-topped *Acacias* fringing the forest patches occurred, while the grassland was composed of tall *Themeda* and *Setarias*, in which *Echinops foeniculum* and *Pteris* were conspicuous. The well-watered kloofs were clothed with evergreen forest and with an abundance of lianes. The dry hillsides were

PLATE 260.

PLATE 261.

orchard-country in which *Faurea saligna*, *Faurea speciosa*, *Dombeya*, *Erythrina*, and *Combretum* were the chief woody plants and *Hyparrhenia* and *Themeda* the principal constituents of the grass cover. In the dry valleys below thorn bush (*Acacia* spp.), *Balanites* and *Euphorbia abyssinica* composed the bush, while stoloniferous *Digitarias*, *Cynodon plectostachyum*, *Cenchrus ciliaris*, *Chloris myriostachy* and *Urochloa* spp. were the grasses typical of the semi-desert country (Pls. 254, 255).

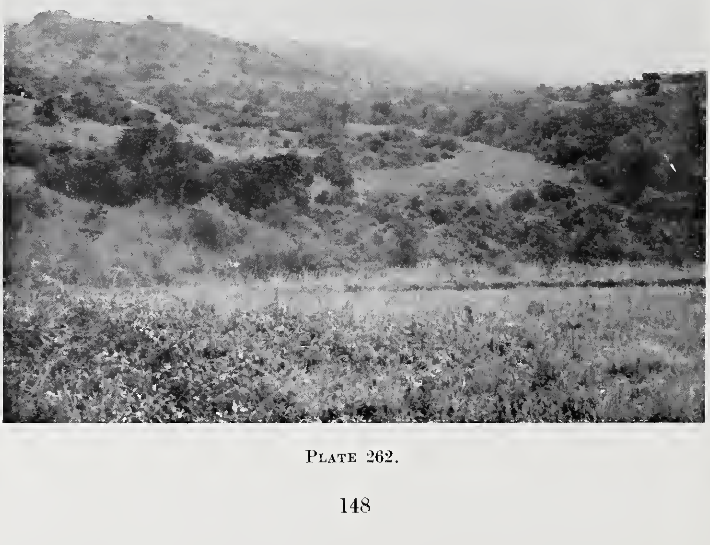

PLATE 262.

PLATE 263.

KAPENGURIA TO KISUMU.

From Kapenguria we returned to Kitale and then travelled via Turbo, Kipkarren, and Kakamega to Kisumu at the north-eastern end of the Kavirondo Gulf. We thus passed through the south-western portion of the Trans Nzoia and the western portions of Uasin Gishu and the Nandi districts, most of which country was lying at an altitude of 6,000–5,000 feet. It just falls within the north-eastern portion of the rain belt of Lake Victoria, which varies from 40 ins. in the north to 60 ins. in the south.

The vegetation throughout was of the woodland type consisting of patches of closed forest and fringing forest, and parkland, in which tall grass characterised by *Cymbopogon* and *Hyparrhenia* dominated. Below this a rich grass flora of *Panicum*, *Brachiaria*, *Chloris*, *Digitaria*, *Paspalum* and *Cynodon* was present. The natural vegetation around the shores of the Kavirondo Gulf in the neighbourhood of Kisumu has been so interfered with by man, both by fire and cropping, that little of it remains to-day. The grass flora south of Kisumu was found to consist mainly of *Cymbopogon*, *Echinochloa*, *Chloris* and *Cynodon*.

KISUMU TO KAMPALA.

From Kisumu we took the road by Butere to Busia, Iganga, Jinja and Kampala in Uganda and thus traversed the country bordering the northern shore of Lake Victoria. Most of this country lies at an altitude of 3,750–4,400 feet. It is flat and undulating and much broken up and intersected by extensive Papyrus swamps. The average annual rainfall over this stretch varies from 50–70 inches and it is a region in which afternoon showers occur all the year round. It was typical parkland vegetation, in which closed forest and fringing forest occurred in stretches surrounded by grass country with trees, in which low trees and bush in groups occurred in high grass, and in which stands of palm were frequent. In addition the Papyrus swamps mentioned above were a striking feature. Between Kisumu and the Valley of the Sio River in Kenya the tall grass was mainly composed of *Cynodon* and *Hyparrhenia*, but north

PLATE 264.

and west of the Sio watershed high elephant grass was dominant in the grass cover (Pl. 256).

It is more than likely that much of the tall *Cymbopogon* country in this south-western portion of Kenya represents areas of past native settlement. In this area of Kenya the scattered tree and bush consisted mainly of *Vitex keniensis*, *Combretum* sp., *Bauhinia* sp., *Kigelia moosa*, *Ficus* sp., *Spathodea nilotica*, *Acacia campylacantha* and *Euphorbia abyssinica*. The conspicuous herbs in the tall grass were mainly *Echinops* and *Leonotis*. The grass cover was made up mainly of *Cymbopogon*, *Hyparrhenia*, *Imperata cylindrica*, *Brachiaria*, *Panicum proliferum*, *Panicum maximum*, *Paspalum scrobiculatum* and a great variety of Star grasses (*Cynodon plectostachyum*) and of *Digitaria abyssinica*. Isolated patches of elephant grass occurred on the roadside between Bukura and Butere. As soon as we entered Uganda at Busia a big change in the vegetation was apparent. The country became more wooded and the trees were much larger (Pls. 257, 258). A high growing annual *Sorghum arundinaceum* and high elephant grass were dominant everywhere. The elephant grass not only occurred along the spruits, but in the open glades and was invading and taking possession of abandoned native lands. Just before reaching Jinja we found termite heaps densely covered with matted growths of giant Star grass (*Cynodon* spp.) (Pls. 259, 260).

Stands of *Phoenix reclinata* were conspicuous around the papyrus swamps, while *Echinochloa pyramidalis* frequently formed a dense fringe around their edges.

Before reaching Kampala the northern shore of Lake Victoria was visited at Koja stock farm, where much of the natural bush had been cleared for experimental work in tsetse fly control. Brightly coloured water lilies were growing in the lake here and along the edge bushes of Ambatch (*Herminiera elaphroxylon*) were in flower (Pl. 261). Some of the larger trees in the littoral forest included *Antiaris africana*, *Canarium Schweinfurthii*, *Maesopsis Eminii*, *Albizzia coriaria*, *Markhamia platycalyx* and *Xylopia Eminii*. The grass cover consisted of

Plate 265.

elephant grass *Cymbopogon* spp., *Hyparrhenia* spp., *Setaria* spp., *Imperata* sp., *Panicum proliferum*, *Panicum maximum* and *Paslapum scrobiculatum*.

Kampala–Fort Portal.

After spending a couple of days in Kampala and Entebbe, calling on officials and replenishing our supplies, we left Kampala for Fort Portal in order to visit Ruwenzori. We travelled from Kampala to Mityana, Mubende, Fort Portal and camped at Ibonde on the north-eastern slopes of the Ruwenzori Range. We thus traversed the northern portion of the western province of Uganda. The road followed roughly the main watershed which on the north drains into Lake Albert and Lake Kwania, and on the south into Lake Victoria and Lake Edward. The two rivers by which these great valleys are drained are striking examples of rivers flowing in opposite directions from the same source. The country traversed was mostly undulating hilly country with flat-topped hills and extensive swamps in the hollows. The average annual rainfall over this area varied from 35–65 inches, the heavier fall being towards the eastern and western portions.

Between Kampala and Lake Wamala savanna vegetation clothed the hill tops, forest covered the slopes of the valleys, and great papyrus swamps with *Phoenix reclinata* thickets occupied the floors of the valleys (Pl. 262). Tall elephant grass lined the roadsides and was dominant throughout (Pl. 263).

Below the elephant grass, and especially when it was cut, a *Brachiaria* formed a dense mat over the soil. Between Lake Wamala and Mubende a stretch of typical dry savanna country was encountered in which *Acacia* tree dominated and was associated with arborescent *Euphorbias*. Trees of *Capparis* and *Erythrina* were also common. The grass cover in this belt was mainly *Cymbopogon*, *Hyparrhenia* and Star grass. From Mubende to Fort Portal parkland vegetation of evergreen forest and dense bush became more and more pronounced. Savanna still characterised the hill tops, and papyrus swamps

Plate 266.

with dense *Phoenix* thickets occupied the floors of the valleys (Pl. 264). Elephant grass again lined the roadsides and was the main grass cover. *Platyceriums* were a conspicuous feature on the forest trees in the Kitale Forest, whose edge we skirted just before reaching Fort Portal, and here we saw, for the first time in the forest, *Cynometra alexandrii*, a genus well represented in the West African forests.

Ruwenzori and the Semliki Valley.

From Ibonde, which is situated on the north-eastern foothills of the Ruwenzori Range we made an ascent of the lower slopes and reached the bamboo forests at just over 8,000 feet, where we encountered heavy cloud and rain and were unable to proceed further (Pl. 265). The lower slopes were covered by high elephant grass in which there were scattered trees and shrubs (Pls. 266, 267). The most conspicuous trees in flower were the Coral tree (*Erythrina tomentosa*) (Pl. 268) and the Flame tree (*Spathodea nilotica*). The shrubs included several species of *Cassia*, a striking mauve-flowered *Acanthus* (*A. pubescens*) and *Tephrosia Vogelii*. Dense evergreen forests covered the higher slopes. Tall arborescent *Vernonias* towered above the elephant grass on the forest edges, while the forest floor was covered with ferns, and numerous epiphytic orchids clothed the branches. On the edges of bamboo (*Arundinaria alpina*) forest a pink balsam *Impatiens elegantissima*) was conspicuous.

The Semliki Valley.

From Ibonde another day was given up to visiting the Semliki Valley and the Eturi Forest, both of which lay to the west of the Ruwenzori Range. To reach these we first travelled north down the narrow valley of the Wasa River along the north-eastern foothills of the Ruwenzori Range, then crossed the lower northern spurs of the range and dropped into the Semliki Valley. We were then on the outskirts of the great Eturi Forest (Pls. 269, 270).

Plate 267.

From Ibonde northwards the country falls rapidly towards the low-lying plains south of Lake Albert and the rainfall correspondingly decreases. Consequently a marked change in the vegetation occurred. While the upper portion of the Wasa Valley was clothed with tall elephant grass and had belts of forest and scattered trees, the more open low-lying portion was typical savanna country with palm stands and thorn bush (Pls. 271, 272). On the lower spurs

Plate 268.

PLATE 269.

of Ruwenzori also much of the elephant grass was replaced by *Themeda*, *Hyparrhenia* and *Cymbopogon*. The Semliki valley west of the range was covered with dense equatorial forest with open stands of high elephant grass (Pl. 273). This forest was composed mainly of *Cynometra alexandrii*, *Khaya anthotheca*, *Bombax reflexum*, *Markhamia platycalyx*, *Ricinodendron africanum* and *Tamarindus indica* (Pl.274). The indigenous West African oil palm (*Elaeis guineensis*),

PLATE 270.

PLATE 271.

the raphia palm (*R. monbuttorum*) and *Phoenix reclinata* also occurred in this forest (Pls. 275, 276). Another feature of these forests was the prevalence of large *Platycerium* ferns on the tree stems (Pl. 277).

FORT PORTAL–KABALE.

From Fort Portal north-east of the Ruwenzori Range we travelled southwards to Kabale situated in the south-western corner of Uganda. On leaving

PLATE 272.

Plate 273.

the elevated plateau country around Fort Portal, we descended into open rolling country along the eastern flanks of the Ruwenzori Range, crossed the low-lying plains between Lake George and Lake Edward, and then ascended mountainous country in the Ankole province and finally climbed up into the Kigezi Highlands at Kabale. The rainfall as recorded over this stretch of country was well reflected in the vegetation. In the north, the upland plateau

Plate 274.

Plate 275.

around Fort Portal which receives a rainfall of 45–60 inches per annum, was covered with parkland vegetation in which closed evergreen forests, fringing forests and scattered trees and bush occurred in high hygrophilous grassland. The dominant grass was elephant grass to the exclusion of almost everything else.

On the lower open rolling country along the foothills of the Ruwenzori

Plate 276.

PLATE 277.

Range where the rainfall was less and averaged 35–45 inches, open savanna vegetation occurred. The trees which characterised this were chiefly *Acacia*, *Balanites* and *Euphorbia* (Pls. 278, 279). The arborescent *Euphorbias* frequently were in dense groups forming miniature *Euphorbia* forests and were surrounded on the outskirts by tall *Acacias*. The grass in this zone of vegetation was made up mainly of *Cymbopogon*, *Hyparrhenia*, *Themeda* and *Imperata*, the latter

PLATE 278.

PLATE 279.

occupying the low-lying hollows or damper spots. A remarkably robust growing Giant Star grass (*Cynodon* sp.) was also encountered in this area (Pls. 280, 281).

The low-lying plains between Lake George and Lake Edward were typical savanna, in which *Acacia* bush and isolated *Euphorbia* trees were scattered in short grass consisting mostly of *Themeda* (Pls. 282 and 283).

The Kazinga Channel (Pl. 284) which connects Lake George with Lake Edward, was fringed with papyrus and *Echinochloa* sp., and the banks covered

PLATE 280.

PLATE 281.

with Star grass. The plains below the Ankole Foothills were composed of beautiful tall *Acacia* tree park country, while the grass cover was made up of *Themeda*, *Imperata* and *Panicum maximum*.

As soon as the hilly country was entered high hygrophillous grassland of elephant grass covered the land, and in it bush, tree and closed forest occurred. The trees noted were *Erythrina*, *Bauhinia*, *Albizzia* and *Ficus*. This elephant grass country, like that around Fort Portal, was being used by the natives for

PLATE 282.

PLATE 283.

intensive banana cultivation. In the hilly country around the beautiful crater lake of Lutoto (Pl. 285) big stretches of evergreen forest were seen (Pl. 286). These were fringed with bracken, giant tree ferns, wild bananas (*Musa fecunda*) and palms (Pl. 287). In the Kalinzu Forest, *Entandrophragma excelsum*. *Parinarium holstii*, *Fagara angolensis*, *Carapa grandiflora* and *Croton macrostachys* were recognised.

PLATE 284.

Plate 285.

From the north-western edge of this forest-clad escarpment we passed gradually into more open grass country, from which the elephant grass disappeared, and its place was taken by tall *Cymbopogons*, *Hyparrhenia*, *Themeda*, *Tristachya* and Star grass. In the bottoms of the valleys there were vast papyrus swamps, along the edges of which *Phoenix reclinata* and *Erythrina tomentosa* were conspicuous (Pls. 288, 289). The hills here were being subjected to constant grass fires and large herds of Ankole cattle were grazing over

Plate 286.

PLATE 287.

them (Pls. 290, 291). This type of grassland continued right up on to the Kigezi Highlands at Kabale at 6,000 feet, most of which receives a rainfall of 34-35 inches.

KABALE TO RUCHURU AND THE SOUTHERN SHORE OF LAKE EDWARD IN THE BELGIAN CONGO.

From Kabale we turned westwards, climbed over the western escarpment of the Kigezi highlands at 9,000 feet, looked down on the beautiful Lake

PLATE 288.

PLATE 289.

Bunyoni (Pl. 292), passed through wide stretches of bamboo forest, and then descended on to the volcanic plains of lava at the foot of the northern slopes of the three Birunga (Mufumbiro) volcanoes—Muhavura, 13,547 feet; Sabinio, 11,960 feet; Mgahinga, 11,400 feet. From here we entered the Belgian Congo and turned north-west to Rutchuru and then travelled across the lacustrine plains south of Lake Edward (Pls. 293, 294).

PLATE 290.

PLATE 291.

After crossing the Rutchuru River we passed through the Parc National Albert along the foothills of the Kasali Mountains as far as Ruindi Camp. From here we paid a visit to the southern shore of Lake Edward. On the Kigezi highlands, after leaving Kabale, two main types of vegetation were encountered. The country from 6,000–8,000 feet was grassland of the type commonly known as "Parkland to Grassland transition", and had long been under the influence

PLATE 292.

Plate 293.

of man. The grass cover was made up mainly of *Cymbopogon*, *Hyparrhenia*, *Tristachya*, *Themeda* and Kikuyu (*Pennisetum clandestinum*). The shrubs and trees in the grass included *Acanthus pubescens*, *Vernonia* sp., *Lobelia lanuriensis*, *Dracaena* sp. and *Erythrina tomentosa*. Above 8,000 ft. forest of mountain bamboo (*Arundinaria alpina*) clothed the hills (Pls. 295, 296). Yellow Crotalarias and a tall Bromus were conspicuous on the outskirts of this bamboo forest.

Plate 294.

Plate 295.

The volcanic plains bore evidence of intense native cultivation and in the Congo Kikuyu grass was taking possession of the native lands everywhere. Befose reaching Rutchuru a belt of tall elephant grass country was encountered in which bush and tropical evergreen forest occurred. Creepers and lianes of every description were a feature of this forest. Immediately north-west of Rutchuru we crossed a wide expanse of open plains covered with tall *Imperata*

Plate 296.

PLATE 297.

cylindrica and some scattered thorn trees (*Acacia hebecladoides*), and then reached the foothills of the Kasali Mountains, which run in a north and south direction (Pls. 297, 298). The eastern slopes of these mountains were grass-covered and bore dense forest patches, and scattered tree and bush. From here we entered the Parc National Albert and after crossing the Rutchuru River (Pl. 299) travelled for some distance between the foothills of the Kasali

PLATE 298.

PLATE 299.

Mountains and the banks of the Rutchuru River. The vegetation of the foothills was tall *Hyparrhenia*, *Setaria*, *Cenchus ciliaris* and *Panicum proliferum* with thorn bush, while the river banks were clothed with tall *Imperata cylindrica*, and dense bush of *Phoenix reclinata* and *Syzygium cordatum*. Here and there large patches of a giant Star grass were encountered in this stretch. Further

PLATE 300.

PLATE 301.

north the road traversed the open plains south of Lake Edward. This was typical savanna country in which a grass cover of *Hyparrhenia*, *Andropogon* and *Sporobolus* was studded with isolated arborescent Euphorbias and thorn bush (Pls. 300, 301). The shore at Lake Edward where the game congregated was short grass composed mainly of *Cynodon* spp.

PLATE 302.

PLATE 303.

RUTCHURU TO LAKE KIVU.

From Rutchuru we travelled south to Goma situated on the northern shore of Lake Kivu, and from here made a short detour in a north-easterly direction to the Ruanda district. Returning to Goma we took the road to Sake situated at the north-west corner of Lake Kivu, and then travelled southwards along the western shores of the lake to the town of Costermansville at its southern

PLATE 304.

Plate 305.

extremity. The lake lies in the Western Rift Valley and is surrounded from the east, north and west by high mountain ranges, which on the north-east and west exceed 9,000 feet. The north-western portion of the lake is steep, broken, mountainous country which rises abruptly from its shores, while the northern and south-western shores are more open. Between Rutchuru and Goma the road traversed a wide stretch of volcanic lava of comparatively

Plate 306.

Plate 307.

recent origin, due to the activity of the Mufumbiro volcanoes. Of these, on the journey southwards Tchaninangongo and Nyamlagira lie to the west and Sabynio, Muhuvura and Mgahinga to the east of the road. The high country lying between Rutchuru and Goma was covered with evergreen forest in which a dense growth of herbaceous creepers was conspicuous. *Spathodea nilotica*, *Erythrina tomentosa* and *Acanthus pubescens* occurred on the outskirts and gave

Plate 308.

Plate 309.

considerable colour to the forest scenery (Pls. 302, 303). Tall elephant grass, giant Star grass and Kikuyu grass made up the grass cover in the forest openings. Around Goma the land was under intense cultivation, the chief crops being bananas and coffee.

The Mfumbiro Range of mountains north-east of Goma was also clothed in dense evergreen forest with bamboo forest on the higher reaches. The lower

Plate 310.

PLATE 311.

south-western slopes have been intensively cultivated and a steady upward invasion of the forested hill slopes is proceeding. The grass cover consisted of tall elephant grass, tall *Cymbopogons*, *Digitaria abyssinica*, *Cynodon* spp. and Kikuyu grass. The latter was invading the cultivated lands everywhere and acting as a great conserver of the soils, especially on the steep slopes.

The outskirts of the bamboo forest were covered with a dense growth of nettle. The lava plains in the Ruanda country east of the Mfumbiro Range

PLATE 312.

PLATE 313.

were covered with a dense turf of Kikuyu grass with which was associated a robust *Bromus*.

Along the northern shore of the lake between Goma and Sake where the country was open was a belt of typical sclerophyllous bush in which trees of *Olea* were dominant, but further inland, to the west as Sake was approached, dense forest vegetation covered the older lava flows. Large trees of *Erythrina*, *Ficus*, *Entada*, *Cussonia*, *Antidesma* and *Rhus* occurred on the outskirts of

PLATE 314.

PLATE 315.

these forests, which were festooned with climbers belonging to the *Acanthaceae*, *Cucurbitaceae* and *Convolvulaceae*. The floors of the forests were covered with ferns, and ferns also grew on the tree trunks and branches. The grass flora was mainly *Imperata*, *Setaria chevalieri* and *Digitaria abyssinica*. Bushes of *Acanthus pubescens* lined the roadsides.

The lava plain produced by the volcanic eruption of Nyamlagira in 1912 was crossed before Sake was reached and was an object lesson in plant succession. It was being colonized by a grey lichen, ferns were just beginning to make their appearance, and a herbaceous *Polygonum* had already established itself (Pls. 304, 305).

The western slopes bordering the lake from Sake to Kalehe were covered with tall elephant grass in which there were scattered trees of *Erythrina tomentosa* and dense forest patches. On the edges of the dense bush along the shores members of the *Marantaceae* family formed a conspicuous feature of the vegetation, while dense growths of climbing plants almost obliterated their supports (Pls. 306, 307). *Anthocleista* and large-leaved *Ficus* trees characterised much of this littoral bush. From Kalehe to Costermansville the flatter and more open country lying between the lake and the mountains to the west suddenly exhibited a remarkable change in the vegetation. It was open grassland country, covered by *Hyparrhenia* which harboured below numerous strains of giant Star grass. This country was densely occupied by natives and was being intensively cultivated (Pls. 308, 309).

LAKE KIVU–KATANGA.

Leaving Costermansville on the southern shore of Lake Kivu we crossed the Western Rift escarpment and descended on to the eastern outskirts of the main Congo basin. From here we travelled in a south-westerly direction across the open plains of the extensive valley of the Lualaba River, and eventually reached the north-eastern edge of the Lualaba plateau. From here we

PLATE 316.

turned in a south-easterly direction, crossed the Hakannson mountain range, the higher reaches of the Lualaba River Valley at Bukama, the Mitamba Mountains and then reached the high plateau country which forms the Congo–Zambezi watershed between Jadotville and Elisabethville in the Katanga province.

In broad outline the chief physiographic elements encountered in this traverse were: the highlands of the Western Rift escarpment, the south-eastern drainage area of the Congo basin, the open plains of the Lualaba Valley. and the plateau of the Congo–Zambezi watershed in the Katanga province. Each of these, as will be seen, was covered with well-marked types of vegetation.

THE HIGHLANDS OF THE WESTERN RIFT ESCARPMENT.

The high country lying between Lake Kivu and the Congo basin at 6,000–9,000 feet was typical mountain grassland. On the lower eastern slopes *Cymbopogon*, *Hyparrhenia*, *Themeda* and *Setaria* largely composed the cover. On the upper slopes *Themeda*, *Trichopteryx*, *Paspalum* and *Digitaria abyssinica* were the chief constituents of the grassland.

The lower western slopes were covered with tall *Cymbopogon*, *Hyparrhenia* and *Imperata*, while the kloofs and valley contained fringing forests and forest islands of West African tropical types, of which the Umbrella tree (*Musanga Smithii*) was conspicuous (Pls. 310, 311)

THE CONGO BASIN.

The south-eastern edge of the Congo basin was traversed in following the road which runs from Costermansville to Kasongo via Itula, and which enters the basin at the foot of the Western Rift escarpment to the west.

The country immediately below the escarpment was mountainous and was covered with dense forest, but from Itula to Kasongo it consisted of low-lying rolling plains covered with high equatorial forest (Pls. 312, 313, 314)

PLATE 317.

These forests carried a dense undergrowth of palms and bamboos and impenetrable thickets of members of the Marantaceae (Pls. 315, 316). Lianes were abundant, while *Platyceriums* and other ferns inhabited the tree stems above (Pls. 317, 318). A striking feature in these equatorial forests along the roadside was the rapid secondary growth of *Musanga Smithii* (Pls. 319, 320).

PLATE 318.

PLATE 319.

THE OPEN PLAINS OF THE LUABABA VALLEY.

These were traversed in the stretch of country lying roughly between Kasongo and Kabongo, a distance of approximately 370 miles. Between Kasongo and Kongolo the road followed the eastern bank of the Lualaba River. At Kongolo the river was crossed by pont and the road then passed along the

PLATE 320.

PLATE 321.

plains which form the watershed, draining into the Lualaba on the east and into the Kasai River on the west.

Between Kasongo and Kongolo the vegetation was parkland country with islands of high tropical forest and fringing forest.

The scattered trees in the parkland were composed of *Bauhinia*, *Entada*, *Erythrina*, *Sclerocarya* and *Acacia*. Stands of Borassus palm occurred in flood areas, and the West African palm (*Elaeis*) throughout the bush and forest. The dominant grass was *Imperata cylindrica* in which were frequently scattered patches of elephant grass and tall *Hyparrhenia*, members of the *Araceae* and *Zingiberaceae*, including such genera as *Hydrosme*, *Kaempferia*, and *Aframonum* were abundant in the grassland. The valley of the Lualaba River, between the Luika River and Kongolo was densely occupied by natives who were cultivating cotton and oil palm (Pls. 321, 322, 323, 324).

After crossing the Lualaba River at Kongolo a wide belt of Borassus palm occupied the low-lying country on the west bank of the river (Pls. 325, 326). On the higher ground adjoining this belt the vegetation was parkland country of low bush, scattered trees and riparian woodland. The ground floor under the bush and trees where fire had occurred was thickly carpeted with white *Kaempferias* in flower. On leaving the lower portion of the valley the vegetation became more open and more savanna-like in character than that in the valley below, but islands of evergreen forest still occurred in which such West African elements as *Marquesia macroura*, with heavily buttressed stems, and *Treculia africana* were recognised (Pls. 327, 328). *Imperata cylindrica* still remained the dominant grass and it was evident that it was subjected to fierce fires. Further south the higher country was covered with gnarled low tree and shrub in which narrow belts of high deciduous forest were encountered for the first time in the Congo (Pl. 329). Tall trees of *Isoberlinia* and *Brachystegia* were present in these forests. The gnarled trees and shrubs in the savanna country consisted of: *Bauhinia*, *Entada*, *Securidaca*, *Terminalia*, *Strychnos*, *Pseudo-*

Plate 322.

lachnostylis, *Diplorrhynchus*, *Combretum* and *Monotes*. The ground below the charred tree stems was hidden by a dense growth of bright-green bracken (*Pteris*) (Pl. 330).

High grass—low tree savannaalso characterised the plateau country around Kabongo, where *Diplorrhynchus* and *Uapaca* were the chief constituents of the bush. Along the streams here trees of the West African *Hexalobus crispiflorus* were in flower and were a striking feature (Pls. 331, 332). Bracken and large aroids formed the greater part of the ground cover in this high grass–low tree savanna (Pls. 333, 334).

From Kabongo to Sungu Mungu, which is situated on the northern slopes of the Lualaba Plateau, the dry woodland savanna of low tree growth began to assert itself more and more as the higher plateau country was reached. The

PLATE 323.

woodland became denser and the trees larger. Fire still played an important part in checking tree growth, and dense bracken invaded the areas continually burnt. In the more open orchard country *Entada*, *Diplorrhynchus* and an arborescent *Dracaena* were the common trees (Pls. 335, 336), whereas the denser woodland country was composed of *Monotes*, *Albizzia*, *Pterocarpus*, *Vitex*, *Isoberlinia* and *Brachystegia*.

PLATE 324.

PLATE 325.

THE PLATEAU COUNTRY OF THE CONGO–ZAMBESI WATERSHED.

This includes the stretch of country which was traversed from Sungu Mungu to Elisabethville and which lies mostly between 4,000 and 5,000 feet above sea level. After crossing the north-eastern off-shoots of the Lualaba Plateau, the road passed over the western extension of the Hakannson mountain range, traversed the Lualaba Valley at Bukama, wound over the Mitumba Range of mountains and finally emerged on to the Congo-Zambesi divide at

PLATE 326.

Plate 327.

Elisabethville. From Sungu-Mungu southwards a big change in the vegetation took place. High, dry and fairly dense deciduous woodland vegetation covered the plateau country and its mountain ranges (Pls. 337, 338, 339, 340) and tropical bamboo thickets of *Oxytenanthera abyssinica* were a special feature of this high deciduous woodland (Pls. 341, 342, 343, 344). The deciduous woodland was composed mainly of *Brachystegia Hockii*, *B. longifolia*, *Isoberlinia paniculata*

Plate 328.

Plate 329.

and *I. tomentosa*, amongst which large trees of *Parinarium*, *Marquesia*, *Pterocarpus*, *Albizzia*, *Amblygonocarpus*, *Afzelia* and *Diplorrhynchus* also occurred.

In the Lualaba Valley between Bukama and Luena dense evergreen bush, deciduous tree and *Borassus* palm stands were associated. The deciduous trees were chiefly *Kirkia acuminata* and *Ricinodendron Rautanenii*.

Plate 330.

PLATE 331.

On the Mitumba Mountains the high woodland vegetation was made up largely of *Brachystegia*, *Isoberlinia*, *Parinarium*, *Pterocarpus*, *Schfflera*, *Cussonia*, *Albizzia*, *Strychnos*, *Markhamia*, *Combretum* and *Diplorrhynchus* (Pls. 345, 346). From the Mituma Mountains to Elisabethville high woodland vegetation, composed mainly of *Brachystegia*, *Isoberlinia*, *Diplorrhynchus* and

PLATE 332.

Plate 333.

Pterocarpus with bamboo patches, covered most of the country traversed (Pls. 347, 348). Occasional thorn forests occurred in alluvial spots (Pl. 349) and not infrequently they were associated with tall Cymbopogons and patches of elephant grass. In the more open spaces in the *Brachystegia* forests, tall *Hyparrhenia* was the dominant grass.

Plate 334.

PLATE 335.

KABONGO TO NORTHERN AND SOUTHERN RHODESIA.

From Elisabethville we travelled to Sakania, entered Northern Rhodesia at Ndola and proceeded via Broken Hill and Lusaka across the Kafue and Zambesi ferries to Miami and Salisbury in Southern Rhodesia, from whence we returned via Enkeldoorn, Fort Victoria, Nuanetsi and Beit Bridge to the

PLATE 336.

PLATE 337.

Transvaal. We thus traversed the plateau country drained by the Lukanga Swamp in Northern Rhodesia, crossed the low-lying valleys of the Kafue and Zambesi Rivers and then ascended the north-western spur of the central plateau of Southern Rhodesia near Miami. Continuing on the central plateau to Salisbury and Enkeldoorn, we left it north of Victoria, and after proceeding

PLATE 338.

PLATE 339.

through a narrow stretch of middle veld, reached the dry low-lying valley of the Limpopo.

From Elisabethville to Broken Hill the plateau was covered with the same type of high deciduous woodland as occurred north of Elisabethville. The odminant trees were *Brachystegia* and *Isoberlinia* with associations of *Uapaca*

PLATE 340.

PLATE 341.

Monotes and *Combretum*. Bamboo thickets, especially around large termite heaps, still formed a prominent feature in this woodland (Pl. 350). South of Broken Hill *Isoberlinia paniculata* and *I. globifera* replaced much of the *Brachystegia* and were associated with trees of *Faurea*, *Dombeya*, *Protea* and *Parinarium*.

On the flat country around Lusaka and bordering the Kafue the vegetation

PLATE 342.

Plate 343.

was of the savanna type in which *Combretum*, *Acacia*, *Pterocarpus*, *Terminalia*, *Albizzia* and *Lonchocarpus* trees were distributed in the grassland of *Hyparrhenia* and *Brachiaria*. In the Kafue Valley mopane and baobab characterised the

Plate 344.

PLATE 345.

savanna-thornland, while dry savanna of *Combretum*, Mopane, *Kirkia*, *Adansonia*, *Sterculia*, *Acacia pallens* and *Commiphora* formed a wide belt in the Zambesi Valley (Pls. 351, 352). Here large trees of *Tamarindus indicus*, *Garcinia Livingstonei* and *Acacia albida* lined the river banks.

PLATE 346.

Plate 347.

On emerging from the dry savanna of the Zambesi Valley open woodland vegetation composed mainly of *Brachystegia woodiana* covered a wide stretch of country. In this, large trees of *Afzelia*, *Monotes*, *Peltophorum*, *Pterocarpus* and *Diospyros* also occurred.

Plate 348.

PLATE 349.

On the plateau between Miami and Salisbury the vegetation was of the savanna type in which islands of bush and tree occurred in the grassland. The dominant tree over this area was *Brachystegia randii* and with it patches of

PLATE 350.

PLATE 351.

Isoberlinia globiflora and *Uapaca kirkiana*, were frequently associated. The grass cover was made up mainly of *Hyparrhenia* and *Trichopteryx*.

Across the main plateau from Salisbury to Victoria, *Brachystegia randii* remained the dominant tree in the open savanna country, except in a few

PLATE 352.

Plate 353.

limited stretches where *Parinarium mobola* and *Terminalia sericea* replaced it in the grassland (Pls. 353, 354).

From here we returned to Pretoria by the road traversed on our outward journey.

Plate 354.

CHAPTER 5.

Summary of Main Types of Vegetation Encountered.

Briefly, the main types of vegetation seen on the expedition may be summarised as follows :—

1. *Equatorial Forest.*—This is tall dense evergreen forest with closed canopy ; it is rich in thick stemmed lianes and in woody and herbaceous epiphytes. Plank buttresses are nearly always present. An undergrowth of dense thickets of palms and *Marantaceae* is of frequent occurence. The rainfall is high and constant. This type occurs in the Congo Basin.
2. *Mountain Forest.*—This is usually forest of high altitudes and subjected to mist and cloud. Coniferous trees are usually present. The temperature is cool. There is a distinct dry season and the trees are usually of a great size. Lianes are common. This type of vegetation is of frequent occurrence in the high mountains of East Africa.
3. *Bamboo Forest.*—This is common in East Africa above the mountain forest at 7,000 feet. It usually reaches to a height of 40–50 feet, sometimes mixed with the mountain forest, but more frequently in pure stands, almost to the exclusion of everything else. The common species is *Arundinaria alpina.*
4. *Riparian Woodland.*—This occurs along rivers and streams in parkland country, and is usually referred to as " Fringing Forest ".
5. *Palm Swamp.*—Common in East and Central Africa, where soils become water-logged during the wet season. *Phoenix*, *Raphia* and *Elaeis* characterise the swamps in regions of regular rainfall, while *Borassus* and *Hyphaene* are common in regions of irregular rains.
6. *Papyrus Swamp.*—This is typical of permanent fresh water swamps in Uganda, and is composed of almost pure stands of tall *Cyperus papyrus.*
7. *Parkland.*—Includes the zone of vegetation abutting on closed forest, in which clumps of trees or islands of forest are surrounded by grassland with trees. Evergreen trees are a conspicuous feature in the parkland.
8. *High Grass-Low Tree Savanna.*—Low growing trees with short gnarled and blackened stems, mostly of deciduous type, rising just above the high grass, characterise this type of vegetation. There is a dry period of 4–5 months, and fierce fires rage through the dry high grass. A strong growth of bracken frequently springs up after the grass is burnt off.
9. *Savanna Woodland.*—This is composed of a continuous canopy of deciduous trees from 15–30 feet high, usually with a light grass and herbaceous cover below. There is a long dry winter period, and fires are not severe enough to harm the trees. *Brachystegia* and *Isoberlinia* characterise this woodland.

10. *Bamboo Thickets.*—Patches of bamboo (*Oxytenanthera abyssinica*) frequently occur in the savanna woodland in the Belgian Congo and Northern Rhodesia, especially on old termite heaps. In some places they form almost impenetrable thickets.

11. *Dry Palm Stands.*—Stands of *Borassus* and *Hyphaene* palms, are frequently found in savanna, savanna–thornland and desert–thornland. Their occurrence along dry water-courses in desert–thornland would suggest that their distribution is more closely associated with the water-table than with a possible chance distribution by elephants. Their occurrence along dykes is also significant.

12. *Savanna.*—The term savanna includes xerophilous grassland with isolated trees and shrubs and comprises the vegetation type commonly called "orchard country."

13. *Savanna–Thornland.*—This type includes vegetation dominated by thorny trees or bushes of *Acacia*, *Commiphora*, *Balanites*, *Sterculia*, *Terminalia* and *Zizyphus*. *Adansonia* and *Copaifera mopane* also occur very frequently in it. It experiences a long dry season, a low rainfall and a great range of temperature. Most of the trees are deciduous.

14. *Thorn Scrub.*—This is the term applied to the dense and impenetrable thorn thickets composed largely of *Acacia*, *Dalbergia*, *Commiphora* and *Strophanthus*, which cover a large portion of Tanganyika. The grass cover is usually sparse and scanty.

15. *Desert Thornland.*—This term is applied to the rather open thorn bush type of vegetation—mostly *Acacia*—which characterises the desert plains of eastern and northern Kenya.

16. *Mountain Grassland.*—This occurs at altitudes of 5,000–7,000 feet, and is composed usually of low-growing perennial grasses with a mixture of herbaceous plants. Trees are generally absent, though mountain forest patches are common in the grassland in sheltered ravines.

    On Ruwenzori the mountain grassland composed of tall elephant grass, is probably of secondary origin, and has taken the place of forest removed by natives in clearing land for cultivation.

17. *Grass-steppe.*—This is xerophilous grassland without tree and bush Large stretches of this type of vegetation were seen on the Serengeti Plains, on the plains south of Arusha and south of Nairobi.

CHAPTER 6.

The Grass Collection.

One of the chief considerations which induced the Government of the Union of South Africa to send the expedition by road to Kenya was that of botanical exploration. In particular, it was felt that the expedition should explore the possibility of securing new pasture and other useful grasses for the Union.

East Africa had already supplied South Africa with several important agricultural grasses, viz., Kikuyu grass, elephant grass or Napier fodder, and Lake Tanganyika buffels grass (*Panicum maximum*). It was thought, therefore, that there might be still further treasures available in East and Central Africa, if some prospecting could be done. The invitation extended by the Government of Kenya to the Union Government furnished the necessary opportunity and thus paved the way for such a prospecting tour.

East Africans, when visiting South Africa and when shown our Kikuyu pastures or finger grass pastures, have boasted for years past that their Star grass pastures in Kenya were far superior to Kikuyu grass. Numerous attempts to establish Star grass in the Union from seed supplied by officials and others in Kenya have invariably failed to produce the tangible results such as had been obtained with Kikuyu grass. The conditions under which these Star grass pastures occurred in East Africa were therefore matters of particular interest and it was also hoped to learn something about Kikuyu grass in its native home. Interesting information and valuable strains of both these grasses, which occupy an important place in the pasturage of East and Central Africa, have been obtained, and considerable material of other important agricultural grasses has also been secured. Altogether, living material, other than seed, of over 700 different strains of grasses was collected and despatched back to the Union for transplanting. Owing to transport difficulties, chiefly in connection with foot and mouth disease, rinderpest and other veterinary restrictions, many consignments of grasses were held up at ports of entry and considerably delayed in transit, with the result that the plants suffered and in many cases arrived at their destination in a lifeless condition. In spite of this, however, over 300 grasses out of the collection have been established at the Rietondale grass introduction station at Pretoria, and much of the most promising material has already been distributed to various parts of the country. Briefly, the principal grasses collected in the different territories were as follows :—

In Southern Rhodesia, Digitarias and Setarias.

In Mozambique, Digitarias, Echinochloas, Elephant grasses, Giant Buffels grasses (*Panicum maximum*) and Setarias.

In Nyasaland, *Acroceras*, Brachiarias, Digitarias, Echinochloas, Elephant grasses, Panicums, Rhodes, Setarias and Star grasses.

In Tanganyika, Brachiarias, *Bromus*, Digitarias, Elephant grasses, Kikuyu and clovers, Panicums, Pennisetums, *Paspalum*, Rhodes, Setarias, *Sorghum*, Star grasses and Urochloas.

In Kenya, *Acroceras*, Brachiarias, Cynodons, Dactyloctenium, Digitarias, Echinochloas, Elephant grasses, Giant Star grasses, Kikuyu, Panicums, Paspalums, Pennisetums, Rhodes, Star grass, and Urochloas.

In Uganda, Brachiarias, Cynodons, Echinochloas, Elephant grasses, Giant Star grasses, Molasses grass, Panicums, Paspalums, Pennisetums, Setarias and Star grasses.

In the Belgian Congo, Brachiarias, Cynodons, Digitarias, Echinochloas, Elephant grasses, Giant Star grasses, Kikuyu, Panicums, Pennisetums, Setarias and Star grasses.

In Northern Rhodesia, *Acroceras*, Cynodons, *Paspalum* and Setarias.

The collection of established grasses at Pretoria included different strains of the following promising perennial grasses :—

Digitarias	86 strains.
Panicums	36 ,,
Cenchrus ciliaris	24 ,,
Star grasses	22 ,,
Elephant grasses	20 ,,
Setarias	15 ,,
Kikuyu	15 ,,
Echinochloas	12 ,,
Giant Star grasses	8 ,,
Urochloas	6 ,,
Panicum repens	5 ,,
Brachiarias	4 ,,
Paspalums	3 ,,

The collection of Digitarias comprised 40 stoloniferous strains, 36 rhizomatous strains, and 10 strains without stolons or rhizomes. The stoloniferous strains were secured in the drier parts of Southern Rhodesia, Mozambique, Nyasaland, Tanganyika and Kenya. The rhizomatous strains inhabited the moister parts of Nyasaland, Kenya, and Uganda. In the highlands of Kenya *Digitaria* (the species) *scalarum* frequently dominated the grassland on the higher altitudes (6,000–7,000 feet) where the soils were too poor to support Kikuyu grass. This type of rhizomatous *Digitaria* may yet prove invaluable in the revegetation of some of the eroded mountainous districts of South Africa and is well worth a trial on the Drakensberg and in Basutoland. It has already shown great promise under the dry conditions of the Cape, e.g., on the Groote Schuur Estate where it has produced a very solid turf and yielded considerable grazing. Amongst the many Panicums collected there are a number which give great promise as valuable hay grasses, especially as they yield abundant seed of high germinating capacity. *Cenchrus ciliaris* is a very valuable drought-resisting pasture and fodder grass, and the collection of a number of different strains from some of the drier parts of Tropical Africa furnished most useful material for plant selection and plant breeding work.

The collection of Star grasses was made from the semi-arid regions of Nyasaland, Tanganyika, Kenya, Uganda and the Belgian Congo. Those grasses were nearly always found on rich alluvial soils. The greatest development of these Star grasses was seen in the Eastern Rift Valley from Nakuru northwards as far as the West Suk country, and also in the Western Rift Valley in the semi-arid plains of the Belgian Congo between Rutchuru and Ruindi camp. It was evident that they occurred in frost-free areas and also in areas sub ected to two rainy seasons during the year. Not only were these natural Star grass pastures regarded by all—both whites and natives—as the most fattening pastures of the country, but in the cultivated areas in Kenya, they were con-

sidered by competent agricultural officers to be most useful in restoring fertility to worked-out soils. Elephant grass was conspicuous in two main regions:—

(1) On the east, chiefly in Portuguese territory in Mozambique between Vanduzi and Tete. Here, it lined the perennial streams that ran through the savanna woodland. The plants on the whole were rather narrow-leaved and approximated closely to the variety of elephant grass that has been propagated in the Union for a number of years under the name of M'fufu grass.

(2) The greatest development of elephant grass, however, was seen in Central Africa, in Uganda and in the Belgian Congo. In Uganda elephant grass was dominant over the country bordering the northern shores of Lake Victoria and extending westwards to Ruwenzori. The north-eastern slopes of Ruwenzori up to 7,000 feet were covered with dense stands up to 12 feet and more in height. The outskirts of the Ituri Forest in the Semliki Valley were also dominated by tall elephant grass. In the Belgian Congo vast tracts of elephant grass covered the mountain slopes bordering the north-western shores of Lake Kivu. Both in Uganda and in the Belgian Congo, the elephant grass was of a broad-leaved type and of a much more robust habit than that which occurred in Mozambique. A number of selections of the better types were made and these comprise some of the material now established in the Union. Some of this material has already shown that it is in many respects vastly superior to the strain originally grown in the Union. In addition to the material that was secured for vegetative propagation, a large quantity of seed was collected from the more promising strains.

Amongst the Setarias that were secured and established are several strains of *Setaria splendida*, which shows great promise for dairy purposes in the coastal belt and in the warmer areas of the Union with high rainfall.

The distribution of Kikuyu grass in East and Central Africa proved of great interest. It was first seen on the Mbeya and Poroto Mountains in Tanganyika, then at Babati Lake, then on the Mbulu escarpment, on the Mbulu Highlands, on the rim of the Ngorongoro crater, and on the lower slopes of Kilimanjaro in Tanganyika. In Kenya its greatest development was seen in the Highlands, i.e, on the Aberdare Range and its foothills, on the lower slopes of Mount Kenya, on the Mau Range, and its northern estensions, on Mount Elgon and on Marsabit Mountain in the desert of the Northern Frontier. In Uganda Kikuyu grass was seen only on the volcanic coils of the Kigezi Highlands In the Belgian Congo, Kikuyu grass was conspicuous on the volcanic soils around Rutschuru, Goma, Sake, Kisenyi and Ruhengeri. All these occurrences leave little doubt that natural Kikuyu grass pastures occur only on soils of high fertility and in areas of high humidity. In nearly all these cases indigenous clovers were present in the Kikuyu grass pasture. Living material was secured from most of these widely separated areas, and strains have been obtained which exhibit marked differences in habit.

Finally, mention must be made of a remarkable section of grasses to which I have given the name of "Giant Star grass". One of these grasses was first seen in a small plot of cultivated grasses at the Kabete pasture plots, outside Nairobi, under the charge of Mr. D. C. Edwards, grassland officer to the Government of Kenya. The origin of the grass was stated to be unknown, but it was said to have sprung up accidentally from seed in a plot that had been planted out from a sod of a fine-leaved lawn grass obtained from Uganda. This grass,

Plate 355.

which was regarded as a most promising Star grass for hay purposes, was standing nearly three feet high in the plot, and had made a dense growth. As it was so unlike any other Star grass that I had seen, it took my fancy, and I decided to keep a sharp look out for it in our further travels. It was not long, however, before we came across the grass in its natural habitat, and only then saw for the first time its remarkable stolons and spreading capacity. It

Plate 356.

PLATE 357.

was first found in the parkland country between Eldoret and Kitale in the Trans Nzoia province of Kenya, and soon afterwards between Kitale and Mount Elgon, where it occurred plentifully and with considerable variation in its vegetative characters. After this it was collected in several further localities in Kenya. Material was also collected in Uganda in the neighbourhood of Ruwenzori, in the Semliki Valley and around Lake Edward and Lake George.

PLATE 358.

It was also found in several localities in the eastern Belgian Congo. Nearly all the plants collected in these different localities exhibited considerable differences in vegetative characters, and out of these which survived the journey to Pretoria eight distinctive strains have been established. These, when propagated at Pretoria, in the Northern Transvaal, and on the Natal Coast, have made phenomenal growth through their rapidly spreading stolons, and, apart from supplying fodder, they offer great possibilities for erosion control in areas where this grass can be successfully established. Individual plants during six months' growth have covered over ten thousand square feet of soil. The plants set fertile seed readily, which gives a high percentage of germination. This small collection of Giant Star grasses offers a rich field also for the plant selector and plant breeder. In fact, the whole collection supplies a wealth of material for future detailed work (Pls. 355, 356, 357, 358).

CHAPTER 7.

Note on the Horticultural Material secured on the Expedition.

BY I. C. VERDOORN.

(*Photographs by R. A. Dyer*).

NATIONAL HERBARIUM, PRETORIA.

Amongst the more interesting mateiial secured on the expedition were the following :—

Echinops amplexicaulis Oliv., Ufiume Mountains, Tanganyika Territory (Plate prepared for "Flowering Plants of South Africa, t. 796.") (Pl. 359.)

PLATE 359

Erlangea tomentosa S. Moore, Poroto Range, Tanganyika Territory.

Pycnostachys Stuhlmannii Gurke, between Katumbi and Fort Hill, N. Rhodesia. (Figured in " Fl. Pl. of S.A., t. 766 ".)

Solenostemon sp. Edge of forest at Mount Mlange, Nyasaland.

Acrocephalus callianthus Brig., Zomba Plateau, Nyasaland. (Figured in " Fl. Pl. of S.A., t. 847 ".)

Iboza riparia N.E. Br., Zomba Plateau, Nyasaland. (Figured in " Fl. Pl. of S.A., t. 767 ".)

Astrochlaena sp., Shiré River, Nyasaland.

Crotalaria recta Steud., Ngorongoro Crater, Tanganyika.

Sesbania sp., N. of Nanyuki, Kenya.

Hibiscus cannabinus L., near Dodoma, Tanganyika.

Celsia brevipedicellata Engl., Ngorongoro Crater, Tanganyika.

Echidnopsis repens Dyer and Verdoorn, Mount Meru, Kenya (Pl. 360).

Plate 360.

Caralluma sp., between Kapenguria and Lodwar, Kenya (Pl. 361).

PLATE 361.

Caralluma n. sp., north of Kapenguria, Kenya (Pl. 362).

PLATE 362.

Euphorbia triaculeata Forsk., 35 miles south of Lokitaung, Kenya.

Euphorbia heterochroma Pax. 45 miles north of Kapenguria, Kenya.

Monadenium sp., 31 m. N. of Iringa, Tanganyika (Pl. 363).

Plate 363.

Monadenium succulentum Schweickerdt, 17 miles N. of Nyeri, Mount Kenya. (Figured in " Fl. Pl. of S.A., t. 776 ".) (Pl. 364.)

PLATE 364.

Jatropha fissispina Pax, near Lokitaung, Kenya (Pl. 365).

PLATE 365.

Thunbergia erecta T. Anders, Eturi Forest, Uganda. (Plate prepared for " Fl. Pl. of S.A., t. 801 ".)

Thunbergia Gibsonii S. Moore, Aberdare Range, Kenya. (Plate prepared for " Fl. Pl. of S.A., t. 800 ".)

Arisaema sp., Ruwenzori, Uganda (Pls. 366 and 367).

PLATE 366.

Arisaema sp., Ruwenzori, Uganda.

Plate 367.

Haemanthus sp., N. of Kapenguria, Kenya. (Probably *H. multiflorus.*)
(Pl. 368.)

PLATE 368.

Hae nanthus sp. (prob. *H. multiflorus*), Eturi Forest, Uganda (Pl. 369).

PLATE 369.

Crinum sp., Ngorongoro Crater, Tanganyika (Pl. 370).

PLATE 370.

Kaempferia sp., Eturi Forest, Uganda.

Ansellia gigantea Reichb., S. Rhodesia.

Ansellia gigantea forma, Turkana Desert, Kenya.

Aloe mketiensis Christian, Mketi Sao Highlands, Tanganyika. (Figured in " Fl. Pl. of S.A., t. 785 ".)

Aloe Nuttii Bak., Mbeya Range, Tanganyika. (Figured in " Fl. Pl. of S.A., t. 762 ".)

Aloe Buchananii Bak., Cholo Road, Nyasaland. (Figured in " Fl. Pl. of S.A., t. 763 ".)

Aloe bulbicaulis Christian, 15 miles S. Sungu Mungu, Belgian Congo (Pl. 371). (Figured in " Fl. Pl. of S.A., t. 630 ".)

Plate 371.

Aloe Pole-Evansii Christian, Kisumu, Kenya. [Figured in " Fl. Pl. of S.A., t. 782 " and photographed (Pls. 372, 373).].

PLATE 372.

Aloe Pole-Evansii Christian.

Plate 373.

Aloe solaiana Christian, Lake Solai, Kenya. [Figured in " Fl. Pl. of S.A., t. 781 " (Pl. 374).]

PLATE 374.

Aloe Erensii Christian, between Lokitaung and Lake Rudolph. [Figured in " Fl. Pl. of S.A., t. 797 " and photographed (Pl. 75).]

PLATE 375.

Aloe marsabitensis Christian and Verdoorn, Gof Bongoli, Marsabit. [Figured in " Fl. Pl. of S.A., t. 798 " (Pl. 376).]

Plate 376.

Aloe lateritia Engl., 17 miles N. of Nyeri, Kenya (Pl. 377).

Plate 377.

Aloe deserti Berger, between Machakos and Yatta Plains, Kenya (Pls. 378, 379).

PLATE 378.

PLATE 379.

Aloe mubendiensis Christian, 32 miles S. of Mubende, Uganda (Pl. 380).

PLATE 380.

Aloe turkanensis Christian, Turkana Desert, Kenya (Pl. 381).

Aloe n. sp. Hills at Oldango, Kenya.

Sansevieria Dooneri N.E. Br. (Figured for " Fl. Pl. of Africa").

Besides the species listed here there are still many more growing in the garden, but these have not actually flowered to date.

PLATE 381.

ACCOUNT OF PLANTS THAT HAVE FLOWERED.

Most of the living plants collected on the Pole Evans East and Central African Expedition, 1938, are flourishing at Pretoria, and many have already flowered.

The spectacular *Echinops amplexicaulis* (Pl. 359), with its pomegranate-red flowers arranged in globose heads up to 4 inches in diameter, was grown from seed collected on the grassy plains of the Ufiume Mountains, Tanganyika.

From the vleis in Nyasaland and Northern Rhodesia came *Pycnostachys Stuhlmannii* (" Fl. Pl. of S.A., t. 766 "), which makes a beautiful show in may and June. The flowers are a delightful shade of blue nearest smalt or phenyl blue. At the same time another Labiate *Solenostemon* sp. (not yet identified

specifically), flowered profusely. The plants range from bushes of 2 feet to 6 feet tall and the racemes, which terminate the many branches are up to a foot long. The flowers are an attractive shade of violet. This plant came from the edge of the forest at Mlange Mountain in Nyasaland.

A third Labiate, one which came from the Zomba Plateau and flowers just a little later, is perhaps the most interesting. It is *Acrocephalus callianthus* Brig. ("Fl. Pl. of S.A., t. 847"). The flowers themselves are very small, arranged in neat compact little heads, while the upper foliage leaves are conspicously and attractively suffused with lavender violet (mauve), the smaller entirely coloured and some of the larger coloured at the base only.

The fourth Labiate, also from Zomba, and flowering from May to June, is better known. It is a form of *Iboza riparia* with very pale mauve flowers arranged in plume-like racemes. (*See* "Fl. Pl. of S.A., t. 767".)

Two species of *Thunbergia* have flowered. The one from the Eturi Forest, west of Ruwenzori (*T. erecta*) had flowers about $1\frac{1}{2}$ inches long, a rich violet blue colour with a golden yellow throat, while the other from the Aberdare Range, Kenya (*T. Gibsonii*), bore large bright orange flowers. (*See* "Fl. Pl. of S.A., t. 800 and 801".)

A plant belonging to the Scrophulariaceae and looking very like a Verbascum flowered freely. It is *Celsia brevipedicellata* Engl. and was found on the edge of the Ngorongoro crater, Tanganyika, and at Thompson's Falls in Kenya. The racemes are long and the flowers a primrose colour.

Hibiscus cannabinus, from near Dodoma, Tanganyika, flowered in May and June. The flowers, which are about 3 inches in diameter are dull, dusky purple in colour, darkest in the centre and bleaching towards the rim.

Among the Stapelieae an *Echidnopsis* collected near Mount Meru, Tanganyika, proved to be an undescribed speces when the flower appeared. It was described as *E. repens* (*See* Plate 361) in the "American Cactus Journal" in November, 1939.

Two species of *Caralluma* (Plates 361 and 362) from somewhere between Kapenguria and Lodwar in Kenya flowered in January. At least one of these is probably an undescribed species.

Among the monocotyledons the most unusual was the *Arisaema* (Pl. 367) from Ruwenzori in Uganda. It resembles the Arum quite closely. The spathe is creamy white with translucent stripes: it is somewhat hooded at the apex and ends in a long drip-point which hangs downwards.

Two species of *Haemanthus* have flowered, one from 88 miles north of Kapenguria and one from the Eturi Forest, Uganda. (*See* Pls. 368 and 369.)

A *Crinum* (Pl. 370) from the Ngorongoro crater bloomed in December. The specific identity of all four of these monocotyledons must still be investigated with the help of botanists overseas.

The orchid *Ansellia gigantea* made a very fine show. There were two distinct forms, one from Southern Rhodesia and another from the Turkana Desert, near Mount Moroto.

No less than fourteen of the species of Aloe have bloomed. Three of these belong to the Leptoaloe section; *Aloe Nuttii* from the Mbeya Range, *Aloe Buchananii* from Cholo Road south of Blantyre and *Aloe Mketiensis* from Mketi, Sao Highlands. All three have been figured for "Flowering Plants of South Africa" and the last-mentioned is described for the first time.

Aloe Pole-Evansii n. sp. (Pl. 372 and 373), figured for "Flowering Plants of South Africa, t. 782" is a great acquisition in the garden, for not only is it a fairly constant bloomer, but the wine-red flowers are very handsome and the plant itself, belonging to the section Prolongatae (caulescent with leaves not

in a dense rosette), is not so common among South African species. It comes from Kisumu in Kenya. A charming little *Aloe* (Pl. 375) from a gorge between Lokitaung and Lake Rudolph also flowers frequently and is a delightful subject for the rockery. It, too, has been figured for "Flowering Plants of South Africa, t. 787" and named after one of the members of the expedition, *A. Erensii*. Several maculates have flowered, the most spectacular so far being *Aloe solaiana* n. sp. (Pl. 374) from Lake Solai ("Fl. Pl. of S.A., t. 781".) An interesting species from the edge of the crater Gof Bongoli, Marsabit, has been figured and described for the same work. The leaves of this species are up to 3 feet long, deeply chanelled and elegantly recurved, forming a very fine rosette sprawling in the sand. It has been named *Aloe marsabitensis* and figured in "Flowering Plants of South Africa, t. 798." (See Plate 376.)

The delicate *Leptaloe Johnstonii* ("Fl. Pl. of S.A., t. 799") from the Yatta Plains south-east of Nairobi flowered in March.

Other plants that have flowered were the tall bushy composite *Erlangea tomentosa* from the Poroto Range, two leguminous plants, *Crotalaria recta*, Ngorongoro Crater, and *Sesbania* sp. from north of Nanyuki, Kenya, the delicate fugacious blue-flowered *Kaempferia* from the Eturi Forest, Uganda, and among the *Euphorbiaceae*, *Monodenium* sp. (?) 31 miles north of Iringa, Tanganyika, *Monadenium succulentum*, Mount Kenya, *Jatropha fissispina*, near Lokitaung (Pl. 365), *Euphorbia heterochroma*, north of Kapenguria and *Euphorbia triaculeata* 35 miles south of Lokitaung, Kenya.

CHAPTER 8.

Acknowledgments.

To the Government of the Union of South Africa for authorising this prospecting tour of the vegetation of the north, my grateful thanks are due. Those who have taken part in an expedition such as that now described know well that it is not all " beer and skittles " and not always " fair weather " the whole time. I would like, therefore, to place on record my appreciation of the sterling qualities of all the staff which accompanied me, and especially their resourcefulness and ingenuity which alone got us through so successfully all the difficulties encountered. The going was hard, but all agreed that it was worthwhile (Pls. 382, 383).

PLATE 382.

Our transport in difficulties in the papyrus swamps in Uganda.

I would like also to thank the staff of the National Herbarium, especially Miss Verdoorn and Miss Chippindall, for the many long hours which they have put in on the identification of the material brought back and for the keen interest which they have displayed in the flora of the great lands to the north.

Plate 383.

Our transport in difficulties in the papyrus swamps in Uganda.

CHAPTER 9.

List of Plants Collected.

Note.—Specimen numbers cited on right of page are those of I. B. Pole Evans and J. Erens.

Appendix A: List of Mosses and Ferns.

Appendix B: List of Grasses.

Appendix C: List of Flowering Plants.

APPENDIX A.

List of Mosses and Ferns.

MOSSES.

Belgian Congo.

Campylopus griseolus (*C. M.*) *Par.* Between Goma and Sake.... 1802
Campylopus chlorotrichus (*C. M.*) *Rehm.* South of Libudi....... 1892

FERNS.

Nyasaland.

Dryopteris sp. Mkulumatzi River.............................. 532
Polypodium irioides *Lam.* Mount Mlange...................... 544
Lonchitus pubescens *Willd.* Mount Mlange.................... 545
Dryopteris thelypteris (*L.*) *Gray.* Mount Mlange............... 547
Nephrolepis cordifolia (*Linn.*) *PR.* Mount Mlange.............. 548
Pelloea virides (*Forsk.*) *Prantl.* var. macrophylla *Sim.*, Mount Mlange... 554
Dryopteris sp., near Mlange.................................. 557
Asmunda regalis *Linn.* 40 miles north of Katunga............. 699

Kenya.

Adiantium capillus-veneris var. Major *Sim*, Gof Bongoli, Kenya.. 1274

Uganda.

Polipodium iriodes *Lam.*, Lake Victoria at Koja................ 1672
Asplenium anisophyllum, *Kze.*, Mount Ruwenzori............... 1707

Belgian Congo.

Polypodium phymatodes *Linn*.................................. 1782
Polypodium phymatodes *Linn.*, Lake Kivu..................... 1783
Dryopteris orientalis (*Gmel.*) *C. Chr.* Between Goma and Sake... 1803
Nephrolepis exaltata (*Linn.*) *Scholt.* Between Goma and Sake.... 1804
Aspidium coadnatum *Wall.*, Lake Kivu........................ 1815
Dryopteris bergiana (*Schl.*) *Ktze.* South of Kongolo............ 1817

APPENDIX B.

List of Grasses.

GRAMINEAE.

ALLOTEROPSIS.

Kenya.

Alloteropsis sp. Locality unknown.......................... 1151
Alloteropsis, nearest A. cimicina (*L.*) *Stapf.* About six miles north of Kiuri.. 1156
Alloteropsis cimicina (*L.*) *Stapf.* About 37 miles north of Kapenguria.. 1528

ANDROPOGON.

Tanganyika.

Andropogon distachyus *Linn.* Toroto Mountains............... 137
Andropogon sp., near A. shirensis *Hochst.* At the bottom of the Ngorongoro Crater.................................. 949
Andropogon pratensis *Hochst.* ex descr. On the top ridge of the Ngorongoro Crater.................................. 973
Andropogon pratensis *Hochst.* ex descr. On the top ridge of the Ngorongoro Crater.................................. 976

Kenya.

Andropogon chrysostachyus *Steud.* Thompson's Falls........... 1293

ANDROPTERUM.

Nyasaland.

Andropterum variegatum *Stapf.* Near Fort Hill................. 99

ANTHEPHORA.

Kenya.

Anthephora Hochstetteri *Nees.* Turkhana Desert.............. 1580
Anthephora sp., between A. nigritana *Stapf* et *Hubb.*, and A. Lynesii, *Stapf & Hubb.* On escarpment above the Turkana Desert.. 1620

ARISTIDA.

(Fide *H. G. Schweickerdt.*)

Kenya.

Aristida submucronata *Schum.* Machakos Yatti Plain.......... 1093
Aristida submucronata *Schum.* Machakos Yatti Plain.......... 1094
Aristida adoensis *Hochst.* ex descr. Thompson's Falls.......... 1345

Aristida papposa *Trin. & Rupr.* ex descr. Turkana Desert, between Kapenguria and Lodwar........................ 1576
Most probably Aristida mutabilis *Trin. & Rupr.* ex descr. Turkana Desert.. 1579
Nearest Aristida Cassanellii *Terr.* ex descr. Turkana Desert, between Lake Taung and Lodwar.......................... 1596A
Aristida adscensionis *Linn.* var. Turkana Desert, between Lake Taung and Lodwar.................................. 1596B

BOTHRIOCHLOA.

KENYA.

Bothriochloa insculpta (*Hochst.*) *A. Camus.* On the Machakos Yatti Plain... 1066
Bothriochloa intermedia (*R. Br.*) *A. Camus* var. acidula *Stapf.* On the Machakos Yatti Plain.............................. 1067
Bothriochloa pertusa (*L.*) *A. Camus.* Machakos Camba Reserve 1121
Bothriochloa pertusa (*L.*) *A. Camus.* North of Nanyuki........ 1220

BRACHIARIA.

NYASALAND.

Brachiaria brizantha (*Hochst.*) *Stapf.* Fort Hill district........ 1169

TANGANYIKA.

Brachiaria brizantha (*Hochst.*) *Stapf.* Karatu.................. 1007

KENYA.

Brachiaria sp., near B. pubifolia (*Hochst.*) *Stapf.* Material poor. Karatina.. 1186
Brachiaria sp., approaches B. viridula *Stapf* and also B. keniensis *Henrard*, from which it differs mainly in the 11-nerved lower glume, and the slightly smaller spikelets. Thompson's Falls 1340
Brachiaria brizantha (*Hochst.*) *Stapf.* Near the Meningai Crater 1385
Brachiaria sp., approaching B. andongensis *Stapf.* Above Lake Solai.. 1403
Brachiaria dictyoneura (*Fig.* and *De Not*) *Stapf.* Between Eldoret and Sherangani Hills........................... 1487
Brachiaria secernenda (*Hochst.*) *Henr.* Turkana Desert, between Lokitaung and Lodwar.............................. 1595

BROMUS.

TANGANYIKA.

Bromus runssoroensis *K. Schum.* Mbeya Mountains............ 117
Bromus leptoclados *Nees.* On the top ridge of the Ngorongoro Crater.. 977

KENYA.

Bromus runssoroensis *K. Schum.* Ngong Hills................ 1142

CALAMAGROSTIS.

UGANDA.

Calamagrostis epigeios *Roth.* Kegezi Mountains................ 1771

CENCHRUS.

TANGANYIKA.

Cenchrus sp. Not matched. About 15 miles north of Arusha, on the road to Moshi.................................... 1029

CENCHRUS.

KENYA.

Cenchrus ciliaris *Linn.* var. Machakos Yatti Plain............... 1089
Cenchrus ciliaris *Linn.* Machakos Camba Reserve.............. 1122
Cenchrus ciliaris *Linn.* var. Turkana Desert, between Lokitaung and Lodwar.. 1583

CHLORIS.

TANGANYIKA.

Chloris gayana *Kunth.* On the bottom of the Ngorongoro Crater. 930
Chloris pycnothrix *Trin.* At the bottom of the Ngorongoro Crater.. 946
Chloris pycnothrix *Trin.* On the top of the Ngorongoro Crater 969
Chloris sp., near C. virgata *Sw.* About 12 miles north of Arusha 1015A

KENYA.

Chloris myriostachya *Hochst.* Machakos Yatti Plain............ 1096
Chloris pycnothrix *Trin.* About 12 miles north of Layana, ± 20–25 miles north of Nyeri................................... 1180
Chloris gayana *Kunth.* Near the Meningai Crater............... 1381
Chloris myriostachya *Hochst.* Eighty miles north of Kapenguria 1628
Chloris virgata *Sw.*, 37 miles north of Kapenguria............... 1529

CLEISTACHNE.

UGANDA.

Cleistachne sorghoides *Benth.* Ituri Forest..................... 1749

CYMBOPOGON.

KENYA.

Cymbopogon caesius (*Nees*) *Stapf.* Near the Meningai Crater.... 1383

CYNODON.

TANGANYIKA.

Cynodon dactylon *Pers.* In the plain at the bottom of the Ngorongoro Crater.. 943
Cynodon plectostachyum *Pilger.* Kozinga Channel between Lake George and Lake Edward....................National Herbarium. 26270

KENYA.

Cynodon dactylon *Pers.* Machakos Yatti Plain.................. 1090
Cynodon dactylon *Pers.* forma. About 12 miles north of Layana, ± 20–25 miles north of Nyeri............................. 1178
Cynodon dactylon *Pers.* forma. About 12 miles north of Layana, ± 20–25 miles north of Nyeri............................. 1179
Cynodon plectostachyum *Pilger.* Kakamega........National Herbarium. 26272
Cynodon plectostachyum *Pilger.* Near Nakuru.................. 26273
Cynodon plectostachyum *Pilger* forma. Rongai, in thornveld.... 26271
Cynodon plectostachyum *Pilger* forma. Gororok, near Thomson's Falls.. 26278
Cynodon sp. Mr. Toogood's farm " Fairfield ", near Nakuru.... 26279

UGANDA.

Cynodon plectostachyum *Pilger.* Ripon Falls, near Jinga........ 26275

Cynodon plectostachyum *Pilger*. Fort Portal, near Mt. Ruwenzori 26274
Cynodon plectostachyum *Pilger*. Near Lake Lutoto, eastern slopes of Mt. Ruwenzori.......... 26280
Cynodon plectostachyum *Pilger*. Foot of Mt. Elgon............ 26277
Cynodon plectostachyum *Pilger* forma. Ripon Falls, Lake Victoria 26276

DACTYLOCTENIUM.

TANGANYIKA.

Dactyloctenium, cf. D. geminatum *Hack*. Material poor. Serengeti Plains.......... 921

KENYA.

Dactyloctenium aegyptium (*L.*) *Beauv*. Machakos Yatti Plain 1097
Dactyloctenium aegyptium (*L.*) *Beauv*. Turkana Desert, between Kapenguria and Lodwar.......... 1577

DIGITARIA.

NYASALAND.

Digitaria scalarum (*Schweinf.*) *Chiov*. Near Fort Hill.......... *No number*

TANGANYIKA.

Digitaria scalarum (*Schweinf.*) *Chiov*. On the top of the Ngorongoro Crater.......... 972
Digitaria sp. About seven miles north of Arusha, on the road to Moshi.......... 1025

KENYA.

Digitaria sp. Machakos Yatti Plain.......... 1091
Digitaria scalarum (*Schweinf*) *Chiov*. Machakos Camba Reserve 1123
Digitaria sp. About seven miles north of Ruiri.......... 1159
Digitaria velutina *Beauv*. Karatina, between Fort Hall and Nyeri 1183
Digitaria sp., near D. Maitlandii *Stapf. & Hubb*. Aberdare Range 1378
Digitaria diagonalis *Stapf*. Sebukia Mountains.......... 1399
Digitaria diagonalis *Stapf*. About 15 miles east of Kericho...... 1462
Digitaria Maitlandii *Stapf & Hubb*. Between Kitale and Eldoret 1484
Digitaria diagonalis *Stapf*. Between Eldoret and Kitale........ 1485
Digitaria ternata (*Hochst.*) *Stapf*. Eighty-eight miles north of Kapenguria.......... 1625
Digitaria abyssinica (*Hochst.*) *Stapf* forma. About 37 miles south of Busia.......... 1666

UGANDA.

Digitaria diagonalis *Stapf*. Ituri Forest.......... 1748
Digitaria sp., near D. velutina *Beauv*. Kigezi Mountains........ 1770

DIPLACHNE.

TANGANYIKA.

Diplachne fusca *Beauv*. At the bottom of the Ngorongoro Crater 932

KENYA.

? Diplachne sp. Material very poor. Namanga River, on the border between Kenya and Tanganyika.......... 1057
Diplachne fusca *Beauv*. Mountain range above the Turkana Desert.......... 1621

ECHINOCHLOA.

KENYA.

Echinochloa crus-galli (*L.*) *Beauv.* Machakos Camba Reserve 1125
Echinochloa pyramidalis (*Lam.*) *Hitch & Chase.* Machakos Camba Reserve.......... 1126
Echinochloa pyramidalis (*Lam.*) *Hitch & Chase.* Machakos Camba Reserve.......... 1127
Echinochloa sp., nearest E. stagnina *Beauv.* About six miles north of Ruiru.......... 1154
Echinochloa pyramidalis (*Lam.*) *Hitch & Chase.* Sixteen miles north of Thika.......... 1173

EHRHARTA.

TANGANYIKA.

Ehrharta abyssinica *Hochst.* Karatu.......... 997

ELEUSINE.

TANGANYIKA.

Eleusine Jaegeri *Pilg.* Edge of Ngorongoro Crater.......... 898
Eleusine Jaegeri *Pilg.* On the top of the Ngorongoro Crater...... 979
Eleusine Jaegeri *Pilg.* On the top ridge of the Ngorongoro Crater 981
Eleusine multiflora *Hochst.* Karatu.......... 995

KENYA.

Eleusine Jaegeri *Pilg.* Thompson's Falls.......... 1334

ENNEAPOGON.

KENYA.

Enneapogon elegans *Stapf.* Turkana Desert, two miles north of the Turkwel River.......... 1573
Enneapogon, probably E. cenchroides (*Licht.*) *Hubbard.* Turkana Desert, between Lokitaung and Lodwar.......... 1594

ENTEROPOGON.

KENYA.

Enteropogon sp. Longido.......... 1056

ERAGROSTIS.

NYASALAND.

Eragrostis aspera (*Jacq.*) *Nees.* Two miles north of Shiré River 586
Eragrostis sp., between E. weberae *Peter* and E. castellaneana *Busc.* ex descr. Dedza Camp.......... 595
Eragrostis sp., between E. weberae *Peter* and E. castellaneana *Busc.* ex descr. N'Kata Bay.......... *No number*

TANGANYIKA.

Eragrostis sp., cf. E. Volkensii *Pilg.* Material very poor. Toroto Mountains.......... 136
Eragrostis sp. On the Mbeya Range.......... 737

Eragrostis cilianensis (*All.*) *Lutati*. Ngorongoro Crater......... 947
Eragrostis tenuifolia (*A. Rich.*) *Hochst.* ex *Steud.* At the bottom of the Ngorongoro Crater.............................. 950
Eragrostis sp., near E. Boehmii *Hack.* and E. chalcantha *Trin.* On top of the Ngorongoro Crater.......................... 968
Eragrostis tenuifolia (*A. Rich.*) *Hochst.* ex *Steud.* On top ridge of the Ngorongoro Crater.............................. 975
Eragrostis sp., near E. tenuifolia (*A. Rich.*) *Hochst.* ex *Steud.* Inflorescence rather contracted. On the top ridge of the Ngorongoro Crater.................................... 976A

KENYA.

Eragrostis superba *Peyr.* At the Nomango River.............. 1071
Eragrostis cilianensis (*All.*) *Lutati*. Machakos Yatti Plain...... 1088
Eragrostis paniciformis (*A. Br.*) *Steud.* About six miles north of Kuiri, near Nairobi................................. 1157
Eragrostis aspera (*Jacq.*) *Nees*. Karatina, about 40–50 miles north of Nyeri....................................... 1185
Eragrostis lasiantha *Stapf*. Thompson's Falls................. 1299
Eragrostis chalcantha *Trin.* Thompson's Falls................. 1300
Eragrostis lasiantha *Stapf*. Thompson's Falls................. 1339
Eragrostis hispida *K. Schum.* Thompson's Falls................ 1341
Eragrostis tenuifolia (*A. Rich.*) *Hochst.* ex *Steud.* Near the Meningai Crater...................................... 1384
Eragrostis sp., near E. paniciformis (*A. Br.*) *Steud.* Near the Meningai Crater...................................... 1386
Eragrostis superba *Peyr.* Eighty-four miles north of Kapenguria 1627

ERIOCHLOA.

KENYA.

+Eriochloa acrotricha *Hack.* Namanga River................. 1059
Eriochloa sp., near E. procera (*Retz.*) *Hubb* ex descr. Hot Springs, Ituri Forest.. 1747
Eriochloa borumensis *Hack.* Lake Rukwa.................. *No number*

EXOTHECA.

KENYA.

Exotheca abyssinica (*Hochst.*) *Anderss.* Thompson's Falls...... 1298

FESTUCA.

KENYA.

Festuca abyssinica *Hochst.* var. typica *St.-Y.* ex descr. Ngong Hills.. 1141

HARPACHNE.

TANGANYIKA.

Harpachne Schimperi *Hochst.* ex *A. Rich.* At the bottom of the Ngorongoro Crater................................ 948

KENYA.

Harpachne Schimperi *Hochst.* ex *A. Rich.* Lake Nakuru......... 1412

HELICTOTRICHON.

KENYA.

Helictotrichon sp. The inflorescence approaches that of H. lachnanthum *Hubbard*, but the leaves are narrower, and the plant appears to be an annual. Ngong Hills 1143
Helictrotrichon cartilagineum *Hubbard*. Thompson's Falls 1301
Helictotrichon sp., near H. elongatum *Hubbard*. Thompson's Falls ....—.............. 1337

HETEROPOGON.

KENYA.

Heteropogon contortus (*L.*) *Beauv.* Karatina 1187

HYPARRHENIA.

PORTUGUESE EAST AFRICA.

Hyparrhenia sp. Eight miles north of Pengwe River, on the road to Villa Gouwia 481

UGANDA.

Hyparrhenia filipendula (*Hochst.*) *Stapf.* Ten miles south of Busia 1660
Hyparrhenia dissoluta (*Nees*) *Hubbard.* Ten miles north of Ibonde on the road to the Ituri Forest 1716

NYASALAND.

Hyparrhenia cymbaria (*L.*) *Stapf.* Camp near N'Kata Bay, on the edge of Lake Nyasa 93
Hyparrhenia nyassae (*Rendle*) *Stapf.* Dedza Camp 589
Hyparrhenia tamba *Anderss.* Zomba Mountains 590
Hyparrhenia dissoluta (*Ness*) *Hubbard.* Fort Hill district 1170

TANGANYIKA.

Hyparrhenia cymbaria (*L.*) *Stapf* f. macra *Stapf.* On the Mbeya Mountains 110
Hyparrhenia sp., near H. pilgeriana *Hubbard.* Toroto Mountains 135
Hyparrhenia collina *Stapf.* At the bottom of the Ngorongoro Crater 942
Hyparrhenia sp. On the upper slopes of the Ngorongoro Crater .. 964
Hyparrhenia tamba *Anderss.* On the upper slopes of the Ngorongoro Crater 967

KENYA.

Hyparrhenia filipendula (*Hochst.*) *Stapf.* Machakos Yatti Plain 1092
Hyparrhenia sp., nearest H. hirta (*L.*) *Stapf.* Ngong Hills 1145
Hyparrhenia cymbaria (*L.*) *Stapf.* Ngong Hills 1146
Hyparrhenia sp. Section Bracteatae. Ngong Hills 1149
Hyparrhenia cymbaria (*L.*) *Stapf.* Ngong Hills 1150
Hyparrhenia sp. Thompson's Falls 1344
Hyparrhenia dissoluta (*Nees*) *Hubbard.* Near the Meningai Crater 1391
Hyparrhenia hirta (*L.*) *Stapf.* Lake Nakuru 1411
Hyparrhenia cymbaria (*L.*) *Stapf.* One mile east of Kericho 1448

Hyparrhenia dissoluta (*Nees*) *Hubbard*. Between Eldoret and Kitale... 1481
Hyparrhenia dissoluta (*Nees*) *Hubbard*. Between Eldoret and Kitale... 1482A
Hyparrhenia sp. Material very poor. Between Eldoret and Kitale... 1482B
Hyparrhenia filipendula (*Hochst.*) *Stapf*. Between Eldoret and Kitale... 1483
Hyparrhenia sp. About 14 miles north of Kitale............... 1491
Hyparrhenia cymbaria (*L.*) *Stapf*. Between Kipkarren and Kakamega.. 1642
Hyparrhenia sp. Mount Elgon.......................... 1509
Hyparrhenia rufa (*Nees*) *Stapf*. About 10 miles north of Kisumu 1651
Hyparrhenia sp. Ten miles north of Ibonde.................. 1715
Hyparrhenia sp. Section Rufae. Fifteen miles north of Nyeri.:. 1196

LOUDETIA.

KENYA.

Loudetia kagerensis *Hubbard*. Sebukia Mountains.............. 1398
Loudetia kagerensis *Hubbard*. Sebukia Mountains............. 1401
Loudetia flavida *Hubbard*. Ngumbretie Kamasia Reserve....... 1425
Loudetia simplex *Hubbard*. Between Eldoret and Shangani Hills 1486
Loudetia kagerensis *Hubbard*. Between Eldoret and Shangani Hills... 1488
Loudetia kagerensis *Hubbard*. Between Soi River and Busia.... 1656

UGANDA.

Loudetia arundinacea *Steud* var. trichantha *Hubb.* ex descr. Ten miles north of Ibonde............................. 1714

MICROCHLOA.

KENYA.

Microchloa caffra *Nees*. Thompson's Falls.................... 1333

MELINIS.

NYASALAND.

Melinis longicauda *Mez* ex *Stapf & Hubb.* ex descr. Near Fort Hill 101
Melinis sp., nearest M. longicauda *Mez* ex *Stapf & Hubb.* ex descr. Dedza Camp.. 588

MISCANTHIDIUM.

KENYA.

Miscanthidium sp., near M. capense (*Nees*) *Stapf*. Between Kakamega and Busia.................................... 1659
Miscanthidium sp. Fort Portal........................... 1755

PANICUM.

NYASALAND.

Panicum maximum *Jacq*. Two miles north of Shiré River....... 587A
Panicum maximum *Jacq*. Dedza Camp...................... 588

Tanganyika.

Panicum sp., near P. massaiense *Mez* and P. repens *Linn.* At the bottom of the Ngorongoro Crater........................ 931
Panicum, cf. P. hygrocharis *Steud.* ex. descr. On the top ridge of the Ngorongoro Crater................................ 980
Panicum atrosanguineum *Hochst.* Near Arusha................. 1013
Panicum trichocladum *Hack.* About 11 miles north of Arusha on the road to Moshi.................................. 1026

Kenya.

Panicum maximum *Jacq.* Machakos Yatti Plain............... 1087
Panicum maximum *Jacq.* About three miles north of Layana.... 1177
Panicum, cf. P. madipirense *Mez* ex descr. Near the Meningai Crater.. 1382
Panicum sp., approaches P. kermesimum *Mez.* Near the Meningai Crater.. 1389
Panicum maximum *Jacq.* Near the Meningai Crater............ 1390

PASPALUM.

Tanganyika.

P. commersonii *Lam.* At the Lupa River, in the Mbeya district near Lake Rukwa.. *No number*

Kenya.

P. commersonii *Lam.* Near the Meningai Crater............... 1387

Uganda.

Paspalum conjugatum *Berg.* Ituri Forest...................... 1721

PENNISETUM.

Portuguese East Africa.

Pennisetum sp. 23 miles east of Macequece.................... 470

Nyasaland.

Pennisetum polystachyon *Schult.* On Zomba Plateau........... 561

Tanganyika.

? Pennisetum clandestinum *Hochst.* On the Toroto Mountains... 130
? Pennisetum clandestinum *Hochst.* On the Mbeya Mountains... 122
Pennisetum trachyphyllum *Pilg.* Edge of Ngorongoro Crater.... 897
Pennisetum Schimperi *A. Rich.* On the top ridge of the Ngorongoro Crater.. 970
Pennisetum mezianum *Leeke.* About 45 miles north of Oldonna 1053

Kenya.

Pennisetum mezianum *Leeke.* On the Machakos Yatti Plain.... 1069
Pennisetum mezianum *Leeke.* About seven miles north of Ruiru 1158

Pennisetum schimperi *A. Rich.* Has rather short bristles. About 15 miles north of Nyeri.................................... 1191
Pennisetum catabasis *Stapf & Hubb.* At Sotik................. 1436
Pennisetum purpureum *Schum.* et *Thon.* Donjuru Farm, near Kisumu.. 1649
Pennisetum polystachyon *Schult.* Between Soi River and Busia 1657

PHALARIS.

KENYA.

Phalaris arundinacea *Linn.* Thompson's Falls.................. 1354
Phalaris arundinacea *Linn.* Aberdare Range.................. 1377

PHRAGMITES.

PORTUGUESE EAST AFRICA.

Phragmites communis *Trin.* Livubwe River, tributary of the Zambesi River.. 514

RHYNCHELYTRUM.

KENYA.

Rhynchelytrum villosum *Chiov.* About 37 miles north of Kapenguria.. 1527

SCHIZACHYRIUM.

KENYA.

Schizachyrium sp. Machakos Yatti Plain..................... 1095

SETARIA.

TANGANYIKA.

Setaria longiseta *Beauv.* Toroto Mountains................... 133
Setaria mombassana *Hermann.* Karatu....................... 186
Setaria sp., near S. sphacelata (*Schum.*) *Stapf* & *Hubbard.* On the top ridge of the Ngorongoro Crater....................... 978

KENYA.

Setaria trinervia *Stapf* ex descr. Ngong Hills.................. 1144
Setaria trinervia *Stapf* var. ex descr. About two miles north of Nanyuki.. 1200
Setaria pallidifusca (*Schum.*) *Stapf* & *Hubb.* Eleven miles north of Kapenguria, at the Luana River....................... 1522

SORGHUM.

TANGANYIKA.

Sorghum sp., very near S. aethiopicum *Rupr.* About 18 miles north of Mawhamuta.................................. 1009

KENYA.

Sorghum verticilliflorum (*Steudel*) *Stapf.* Fort Hall............. 1168
Between Sorghum sudanense (*Piper*) *Stapf* and S. verticilliflorum (*Steud.*) *Stapf.* Sixteen miles north of Thika............... 1172

Sorghastrum rigidifolium (*Stapf*) *Chippindall* comb. nov. (*Sorghum* rigidifolium *Stapf* Fl. Trop. Afr. ix, 143 (1917). Between Eldoret and Kitale........ 1480

SPOROBOLUS.

TANGANYIKA.

Sporobolus virginicus *Kunth*. On the bottom of the Ngorongoro Crater........ 929
Sporobolus filipes *Stapf Ms*. At the bottom of the Ngorongoro Crater........ 945
Sporobolus sp., near S. capensis *Kunth*. On the top ridge of the Ngorongoro Crater........ 974
Sporobolus sp. About seven miles north of Arusha, on the road to Moshi........ 1024

KENYA.

Sporobolus filipes *Stapf* ex *Hubb*. At Nawanga River........ 1055
Sporobolus sp. Material poor. Nawanga River........ 1058
Sporobolus fimbriatus *Nees* var. latifolia *Stent*. Kabete........ 1140
Sporobolus filipes *Stapf* ex *Hubb*. Mount Elgon........ 1510
Sporobolus (?) fimbriatus *Nees*. Ten miles north of Karatina.... 1182
Sporobolus pyramidalis *Beauv*. North of Nanyuka........ 1219
Sporobolus stapfianus *Gandoger*. Sebukia Mountains........ 1400
Sporobolus spicatus *Kunth*. Lake Nakuru........ 1413
Sporobolus (?) capensis *Kunth*. Locality unknown........ 1414
Sporobolus filipes *Stapf* ex *Hubb*. Kamasai Reserve........ 1424
Sporobolus festivus *Hochst*. Kamasai Reserve........ 1434
Sporobolus spicatus *Kunth*. Turkana Desert, between Kapenguria and Lodwar........ 1577
Sporobolus spicatus *Kunth*. Turkana Desert........ 1578
Sporobolus spicatus *Kunth*. Lake Rudolf........ 1589A
Sporobolus sp., near S. indicus *R. Br*., var. laxus *Stapf*. Mountain range, above Turkana Desert........ 1622
Sporobolus festivus *Hochst*. var. fibrosus *Stapf*. Eighty-eight miles north of Kapenguria........ 1624
Sporobolus panicoides *A. Rich*. Eighty miles north of Kapenguria 1626
Sporobolus filipes *Stapf* ex *Hubb*. Seventy-four miles north of Kapenguria........ 1629
Sporobolus pyramidalis *Beauv*. About six miles north of Ruiru near Nairobi........ 1155

THEMEDA.

TANGANYIKA.

Themeda triandra *Forsk*. Ngorongoro Crater........ 944
Themeda triandra *Forsk*. On the top ridge of the Ngorongoro Crater........ 971

KENYA.

Themeda triandra *Forsk*. On the Machakos Yatti Plain........ 1070
Themeda triandra *Forsk*. Ngong Hills........ 1147
Themeda triandra *Forsk*. Ngong Hills........ 1148
(?) Themeda sp. Material very poor. About two miles north of Fort Hall........ 1174
Themeda triandra *Forsk*. About 15 miles north of Nyeri........ 1192
Themeda triandra *Forsk*. Thompson's Falls........ 1294

TRICHOPTERYX.

NYASALAND.

Trichopteryx fruticulosa *Chiov.* ex. descr. Near Fort Hill........ *No number*

TRICHOLAENA.

PORTUGUESE EAST AFRICA.

Tricholaena monachne (*Trin.*) *Stapf & Hubb.* No locality...... *No number*

UROCHLOA.

KENYA.

Urochloa sp. Material very poor. On the way to Lake Solai.... 1392

APPENDIX C.

List of Flowering Plants.

CYCADACEAE.

ENCEPHALARTOS.

Belgian Congo.

Encephalartos Poggei *Aschers* (E. lemarinelianus *de Willd.*), about five miles south of Katchi.................................. 1840

TAXACEAE.

PODOCARPUS.

Kenya.

Podocarpus gracilior *Pilg.* North of Nanyuki.................... 1213
Podocarpus gracilior *Pilg.*, near Rumuruti...................... 1357
Podocarpus gracilior *Pilg.* Mount Elgon...................... 1507

PINACEAE.

JUNIPERUS.

Tanganyika.

Juniperus procera *Hochst.* ex *A. Rich.* Ngorongoro Crater....... 901

Kenya.

Juniperus procera *Hochst.* ex *A. Rich.* Foot of Mount Kenya.... 1199
Juniperus procera *Hochst.* ex *A. Rich.* Thompson's Falls.......... 1313

HYDROCHARITACEAE.

OTTELIA.

Nyasaland.

Ottelia ulvifolia (Pl.) *Walp.* Fifteen miles north of Dwanga..... 626

CYPERACEAE.

ASCOLEPIS.

Nyasaland.

Ascolepis bellidiflora (*Welw.*) *Cherm.* ex descr. et ic. Fifteen miles north of Dwanga... 624

CYPERUS.

Kenya.

Cyperus immensus *C. B. Cl.* Between Fort Hall and Nanyuki.... 1184

FUIRENA.

Nyasaland.

Fuirena glomerata *Lam.* On Zomba Plateau.................. 560

TANGANYIKA.

Cyperaceae (indet.). Ngorongoro Crater........................ 928

PALMACEAE.

ELAEIS.

UGANDA.

Elaeis guineensis *Jacq.* (?) Eturi Forest........................ 1741

ARACEAE.

ARISAEMA.

UGANDA.

Arisaema ruwemzoricun *N.E.Br.* Ruwenzori.................. 1688

ANCHOMANES.

BELGIAN CONGO.

Cfr. Anchomanes difformis (*Blume*) *Engl.* Thirty miles south of Tangane.. 1831

COMMELINACEAE.

PALISOTA.

BELGIAN CONGO.

Palisota sp. Kabongo to Bukama.......................... 1868

LILIACEAE.

GLORIOSA.

TANGANYIKA.

Gloriosa virescens *Lindl.* Slopes of the Ngorongoro Crater....... 994

KENYA.

Gloriosa virescens *Lindl.*—
- Rumuruti in grass.................................. 1361B
- Aberdare Range, in shrubs............................ 1375
- Five miles east of Lumbwa............................ 1466
- Twenty miles north of Kitale, fls. red, yellow edged......... 1500

Cfr. Gloriosa abyssinica *A. Rich.* Eleven miles south of Lodwar, Turkana, fls. yellow.................................. 1574

ANTHERICUM.

NYASALAND.

Anthericum sp. (?) Five miles south of Chindi................. 542

KNIPHOFIA.

NYASALAND.

Kniphofia sp. Fifteen miles north of Katunga................ 700

TANGANYIKA.

Kniphofia sp. Mbeya Range.............................. 731
Kniphofia sp. Poroto Range (poor specimen)................. 750

Kenya.

Kniphofia sp., cf. K. Snowdenii, *C. H. Wr.* Thompson's Falls.... 1349
Kniphofia sp. Aberdare Range.............................. 1367

ALOE.

Portuguese East Africa.

Aloe Christianii *Reynolds.* Ten miles south of Nyasaland border 528

Nyasaland.

Aloe Buchananii Bkr. Shiré Highlands, 12 miles south of Limbe 540
Aloe sp. Five miles south of Cholo.......................... 543
Aloe Cameronii *Hemsl.* 53 miles north of Lilongwe............... 606
Aloe mzimbana *Christian & Verdoorn.* Figured for "Fl. Pls. of South Africa," t. 838. Eighteen miles north of Mzimba..... 643

Tanganyika.

Aloe nuttii *Bkr.* Mbeya Range.............................. 742
Aloe sp. (maculate), Mbeya Range............................ 744
Aloe mketiensis *Christian* n. sp. ("Fl. Pl. of South Africa," 1940) Sao Highlands, Mketi........................... 795
Aloe sp. Sao Highlands..................................... 798
Aloe floramaculata *Christian.* Seven miles south of Bubu River 828
Aloe n. sp. Babati, near Hangero............................ 872
Aloe floramaculata *Christian.* On hills, Oldango............... 1019

Kenya.

Aloe Johnstonii *Bak. & Stapf.* Yatta Plains................... 1099
Aloe deserti *Berg.* Wakamba Reserve......................... 1108
Aloe n. sp. Nyeri.. 1193
Aloe n. sp. Isiola.. 1229
Aloe solaiana *Christian* ("Fl. Pl. of South Africa," 1940, t. 781) Lake Solai.. 1395
Aloe marsabitensis *Verdoorn & Christian.* Gof Bongoli Crater 1275
Aloe Erensii *Christian.* Lake Rudolph "Fl. Pl. of South Africa," t. 797)... 1587
Aloe turkanensis *Christian.* Turkana Desert................... 1610
Aloe Pole-Evansii *Christian* ("Fl. Pl. of South Africa," t. 782) Kisumu.. 1650

Uganda.

Aloe mubendiensis *Christian.* South of Mubendi............... 1685
Aloe n. sp (?) (Saponarieae). Forty-seven miles south of Lutoto. 1761

Belgian Congo.

Aloe bulbicaulis *Christian.* Twelve miles south of Kongola (Specimen from plant in garden)......................... 1834

Southern Rhodesia.

Aloe greatheadii *Schonl.* Twenty-five miles south-west of Enkeldoorn.. 1910

URGINEA.

KENYA.

Urginea sp. Fifteen miles north of Meru.......................... 1228

DRACAENA.

UGANDA.

Dracaena sp. cfr. D. reflexa *Lam.* var. nitens *Bak.* On Ruwanzori Mountain.. 1694

BELGIAN CONGO.

Dracaena sp. cfr. D. reflexa var. Buchneri. Kabongo............ 1862

SANSEVIERIA.

KENYA.

Sansevieria sp. (no leaves). Moroto Mountains, above Turkana Desert.. 1623

Sansevieria dooneri, *N.E. Br.* Ngong.......................... *No number*

ASPARAGUS.

KENYA.

Asparagus Buchanani *Bkr.* (?). Wakamba Reserve............. 1120

HAEMANTHUS.

BELGIAN CONGO.

Haemanthus sp. Prob. H. multiflorus *Martyn.* In forest along Lake Kivu.. 1782

AMMOCHARIS.

KENYA.

Ammocharis tinneana (*Klotsch. & Peyr.*) *Milne-Redhead* and *Schwkdt.* Turkana Desert................................. 1564

CRINUM.

TANGANYIKA.

Crinum sp.. 985

IRIDACEAE.

ROMULEA.

KENYA.

Romulea Fischeri *Pax*, ex. descr. Thompson's Falls............ 1303

MORAEA.

NYASALAND.

Moraea sp. Flower described as blue, not preserved. Nine miles south of Katunga.. 696

Moraea angusta *Ker.* (flowers rather large). Three miles north of Fort Hill (yellow flower)................................ 705

DIERAMA.

TANGANYIKA.

Dierama sp., cfr. D. vagum *N.E. Br.* Bracts on some specimens tapering to a point. Mbeya Range.......................... 724

CROCOSMIA.

NYASALAND.

Crocosmia aurea *Pl.* Twenty-five miles north of Ekwedeni...... 675

GLADIOLUS.

PORTUGUESE EAST AFRICA.

Gladiolus psittacinus *Hook.* Twenty-three miles east of Macequece to Vanduzi...................................... 469

NYASALAND.

Gladiolus sp. Flower pink with white stripes. Ten miles north of Dwanga River.. 620

TANGANYIKA.

Gladiolus quartinianus *A. Rich.* orange flowers. Ngorongoro Crater.. 992

Gladiolus quartinianus *A. Rich*............................... 892

UGANDA.

Gladiolus Melleri Bkr. (" Fl. Pl. of South Africa ", t. 768). Thirty-one miles south of Lutoto.............................. 1760

RHODESIA.

Gladiolus sp., cfr. G. Oatsii but colour of flower different. Broken Hill.. 1906

ZINGIBERACEAE.

KAEMPFERIA AND AFRAMOMUM. (?)

NYASALAND.

cfr. Aframomum sp. (?) or Kaempferia. Malonge.............. 546

UGANDA.

Kaempferia sp. Eturi Forest............................... 1729

BELGIAN CONGO.

Kaempferia sp. (?) Sixty-eight miles south of Kabongo......... 1872

Kaempferia sp. Large white flowers. Twelve miles south of Kongolo.. 1833

Aframomum (?) or Kaempferia. Thirty miles south of Tanzani.. 1830

COSTUS.

BELGIAN CONGO.

Costus sp. (cfr. C. afer but heads large, cfr. also C. lucanusiana) Lake Kivu (?).. 1822

ORCHIDACEAE.

SATYRIUM.

KENYA.

Satyrium sp. Aberdare Range.............................. 1368
Satyrium sp. Aberdare Range (pink flowers).................. 1369
Satyrium sp. Fifteen miles north of Kitale................... 1499

DISA.

KENYA.

Disa sp., cfr. D. Schimperi. Aberdare Range.................. 1370
Disa sp., cfr. D. versicolor. Lake Solai....................... 1405

LISSOCHILUS.

KENYA.

Lissochilus sp. Kisumu...................................... 1644

UGANDA.

Lissochilus sp. Thirty-one miles south of Lutoto............... 1759
Lissochilus krebsii *Reichb. f.* Kisoro on Uganda–Congo border... 1767

BELGIAN CONGO.

Lissochilus sp. 86 miles south of Kabongo.................... 1874
Lissochilus sp. (cfr. L. milanjianus), near Sungu Mungu.......... 1876
Lissochilus sp. (cfr. L. Roscheri)............................ 1877

EULOPHIA.

KENYA.

Eulophia sp. (*see* S.A. species E. ensata). Slopes of Meningai Crater.. 1409

UGANDA.

Eulophia sp. (*see* S.A. species E. Zeyheri). Sixty miles south of Lutoto.. 1762

BELGIAN CONGO.

Eulophia sp. Between Kamitza and Costermansville............ 1819
Eulophia arenaria (?). Between Kamitza and Costermansville.... 1820
Eulophia sp. Forty-three miles south of Kabongo.............. 1871
Eulophia sp. Near Sungu Mungu.......................... 1878

ANGRAECUM.

TANGANYIKA.

Angraecum Scottellii *Rendl.* (?). Forty-seven miles north of Nyambi... 785A

LISTROSTACHYS.

TANGANYIKA.

Listrostachys sp. Ten miles north of Ikwera.................. 785

MYSTACIDIUM.

KENYA.

Mystacidium sp. (Flowers blue.) Burnt Forest................ 1473
Mystacidium sp. (?) Eturi Forest............................ 1744

BELGIAN CONGO.

Mystacidium sp. Sake.. 1774

UGANDA.

(?) genus. Lutoto Forest.................................... 1758

MYRICACEAE.

MYRICA.

TANGANYIKA.

Myrica salicifolia *Hochst.* ex *A. Rich.* Tree 20 ft. Kilimanjaro.. 1050
Myrica salicifolia *Hochst.* ex *A. Rich.* Shrub 4 ft. Kilimanjaro.. 1049

BELGIAN CONGO.

Myrica sp. Luanda country near Goma......................... 1797

ULMACEAE.

CELTIS.

KENYA.

Celtis sp. (?) (Leaves only; rough surface). Three miles north of Meru.. 1226

TREMA.

UGANDA.

Trema guineensis *Ficalho* (?) (Leaves only; very rough surface). Shrub 4 ft. Thirty-seven miles south of Busia............. 1665

BELGIAN CONGO.

Trema guineensis *Ficalho.* Between Goma and Sake............ 1805

MORACEAE.

MYRIANTHUS.

BELGIAN CONGO.

Myrianthus arboreus *P. Beauv.* (Tree 30 ft.) Sixteen miles south of Kama.. 1828

FICUS.

PORTUGUESE EAST AFRICA.

Ficus ingens *Miq.* (?) Leaves only, tree 30 ft. Banks of Livubwe River... 512

NYASALAND.

Ficus sp. cf. F. capensis *Thunb.* but receptacles appressed pubescent, resembling F. mallatocarpa *Warb.* Tree 20–30 ft. Seventy-five miles north of Shiré River.................... 583

Ficus sp., possibly F. stuhlmannii *Warb.* (leaves only). Tree ± 30 ft. Six miles north of Rukuru River 686
Ficus sp. possibly immature specimen of F. mallotocarpa *Warb.* Tree 20–25 ft. Fifty-three miles north of Ruenya 633
Ficus sp. (leaves only). Tree 30 ft. Twenty-eight miles north of Mzimba 655
Ficus verruculosa *Warb* (?). Shrub 20 ft., growing in bush, between Mzimba and Ekwendeni 676

KENYA.

Ficus sp. Tree 30–40 ft. Slopes hills Ngong 1138
Ficus sp., growing under moist conditions, tree 50 ft. at Karatina, near Nyeri 1181

UGANDA.

Ficus sp. cfr. F. sansibarica *Warb.* Tree 70–80 ft. Thirty miles south of Busia 1661
Ficus sp. (leaves only). Tree 80–90 ft. Thirty-three miles south of Busia 1662
Ficus sp. (?) (leaves only). Shrub, c. 4 ft. Thirty-seven miles north of Busia 1665
Ficus sp. (leaves only—not matched). Lake Victoria at Koja 1671

BELGIAN CONGO.

Ficus Vallis-Choudae *Del.* (?) Tree 40 ft. In forest along Lake Kivu, near Sake 1785
Ficus sp. (Sec. Urostigma, possibly F. ingentoides *Hutch.* ex. descr.) Tree 40 ft. Lake Kivu 1790
Ficus rhynchocarpa *Warb.* About 10 ft. Along Lake Kivu 1808
Ficus Vallis-Choudae *Del.* (?) (leaves only). Tree 50 ft. Lake Kivu 1809
Ficus sp. Sec. Bibracteatae, possibly F. rubroreceptacula *De Wild.* ex. descr. (Long leaves, ostiole pore-like). Lake Kivu 1812

URTICACEAE.

URTICA.

TANGANYIKA.

Urtica massaica *Mildbr.* (?) = Greenway 4301 (leaves opposite). 3 ft. or more, stinging hairs, in moist jungle conditions, upper slopes Ngorongoro Crater 958

PROTEACEAE.

FAUREA.

NYASALAND.

Faurea sp. Tree 20–30 ft. Zomba Plateau 564
Faurea speciosa *Welw.* On road to Dedza 590
Faurea speciosa *Welw.* Tree 20 ft., near Dedza on koppie 591

Faurea sp. Fifty-three miles north of Dwanga 631
Faurea speciosa *Welw.* (?) Thirty-eight miles north of Mzimba. Tree 30 ft. 656

TANGANYIKA.

Faurea speciosa *Welw.* Sao Highlands. Tree 30 ft. in sandy soil among grass 794

KENYA.

Faurea speciosa *Welw.* (?). Fifteen miles north of Kitale 1496

PROTEA.

PORTUGUESE EAST AFRICA.

Protea chionantha *Engl. & Gilg.* Sixty miles north of Livubwe River 526

NYASALAND.

Protea madiensis *Oliv.* var. latifolia *Engl.* Sixteen miles north of Fort Hill. Shrub 10 ft. 711

TANGANYIKA.

Protea Stolzii *Mildbr.* Shrub 12 in. Mbeya Range in valley 747
Proteaceae (leaves only). Tree 20 ft., growing on slopes Fort Hill district 1165

LORANTHACEAE.

LORANTHUS.

NYASALAND.

Loranthus Dregei *E. & Z.* var. (?). Four miles north of Mzimba, on Brachystegia 639

TANGANYIKA.

Loranthus inaequilateris *Engl.* (?) but leaves rather narrow, or possibly L. woodfordiodes *Schweinf.* (= Stolz 2536 and 1905). On Poroto Range; scarlet flowers 759

KENYA.

Loranthus sagittifolius *Sprague.* Yellow flowers. Thirty-two miles Nanyuki. Growing on Acacia 1283
Loranthus sp. (large leaves, no flowers). Between Kitale and Serengare Hills 1478

VISCUM.

KENYA.

Viscum sp. On Combretum, Wakamba Reserve 1117

SANTALACEAE.

OSYRIS.

KENYA.

Osyris compressa (*Berg.*) *A. DC.* Evergreen tree. Fifty miles north of Namanga.. 1063

Osyris compressa (*Berg.*) *A.DC.* Shrub 8 ft. Thompson's Falls Camp.. 1348

Osyris compressa (*Berg.*) *A.DC.* Shrub 4–6 ft. On edge of forest, Thompson's Falls..................................... 1352

THESIUM.

NYASALAND.

Thesium sp., 53 miles north Lilongwe. 12 in. high under trees... 613

OPILIACEAE.

OPILIA.

TANGANYIKA.

Opilia sp. (?) (Leaves only, about 8 cm. long and 1.5 cm. wide.) Tree 20 ft., 13 miles north of Karatu....................... 1000

BALANOPHORACEAE.

THONNINGA.

UGANDA.

Thonninga ugandensis *Hemsl.* Eturi Forest.................. 1750

POLYGONACEAE.

RUMEX.

TANGANYIKA.

Rumex maderensis *Lowe.* Near Mbulu....................... 886

BELGIAN CONGO.

Rumex maderensis *Lowe.* Between Gome and Sake............ 1800

CHENOPODIACEAE.

SALSOLA.

KENYA.

Salsola aphylla *Linn. f.* Shrub 4 ft., desert conditions. Sixty miles north of Isiola.................................... 1239

AMARANTACEAE.

DIGERA.

KENYA.

Digera sp. 12 in. high. Turkana Desert between Kapenguria and Lodwar.. 1609

SERICOCOMOPSIS.

KENYA.

Sericocomopsis hildebrandtii *Schinz.* Turkana Desert between Lokitaung and Lodwar. Bush 12 ins. desert conditions...... 1602

NYCTAGINACEAE.

BOERHAAVIA.

KENYA.

Boerhaavia sp. Bush 12 in., desert conditions. Turkana Desert, between Lokitaung and Lodwar.......................... 1598

PHYTOLACCACEAE.

PHYTOLACCA.

TANGANYIKA.

Phytolacca dodecandra *L'Herit.* Creeper growing on mountain slopes 10 miles north of Mbulu............................ 888

KENYA.

Phytolacca dodecandra *L'Herit.* Shrub about 2 ft. Growing under trees at Meru.................................... 1224

CARYOPHYLLACEAE.

POLLICHIA.

KENYA.

Pollichia campestris *Soland.* Herb 15 in. in grass, at Marsabit... 1271

NYMPHAEACEAE.

NYMPHAEA.

NYASALAND.

Nymphaea lotus *L.* Shirwa River........................... 575

BELGIAN CONGO.

Nymphaea caerulea *Sav.* Along Lake Kivu near Sake........ 1811

RANUNCULACEAE.

DELPHINIUM.

TANGANYIKA.

Delphinium sp. Mbeya Range................................ 729
Delphinium candidum *Hemsl.* Toroto Range.................. 758
Delphinium candidum *Hemsl.* Filaments sometimes glabrous, calyx lobes not obovate spathulate. Slopes Ngorongoro Crater.. 893
Delphinium candidum *Hemsl.* Ngorongoro Crater.............. 991

KENYA.

Delphinium macrocentron *D. Oliv.* Seven miles south of Lumbwa 1435

CLEMATOPSIS.

NYASALAND.

Clematopsis kirkii (*Oliv.*) *Hutch.* Thirty miles north of Rukuru River.. 694

ANONACEAE.

HEXALOBUS.

BELGIAN CONGO.

Hexalobus crispiflorus *A. Rich.* On road to Kamitya............ 1842

CAPPARIDACEAE.

CLEOME.

PORTUGUESE EAST AFRICA.

Cleome hirta (*Kl.*) *Oliv.* Near Tete.......................... 510

KENYA.

Cleome sp. (?) 24 in. high, edge of Turkhana Desert.............. 1559
Cleome brachycarpa *Vahl.* ex descr. Turkana Desert near Lodwar 1600

COURBONIA.

PORTUGUESE EAST AFRICA.

Courbonia glauca (*Kl.*) *Gilg. & Ben.* Four miles north of Livubwe River.. 515

CAPPARIS.

KENYA.

Capparis galeata *Fres.* About 90 miles north of Isiola........... 1253
Capparis erythrocarpa *Isert* (*see* fig. Engl. and Drude Veg. IX, iii, p. 238). Near Kisumu................................ 1647

BOSCIA.

PORTUGUESE EAST AFRICA.

Boscia sp. cf. B. pachyandra *Gilg. & Ben.* Shrub 8 ft., 14 miles north of Livubwe River.............................. 516

TANGANYIKA.

Boscia sp. cfr. B. pachyandra *Gilg. & Ben.* Forty miles south of Dodoma.. 810
Boscia sp. (leaves only, about 8 cm. long, 1·5 cm. wide). Tree 20 ft.; 13 miles north of Karatu........................ 1000

KENYA.

Boscia sp. (prob. = No. 516). Turkana Desert, between Kapenguria and Lodwar.................................... 1570

CADABA.

KENYA.

Cadaba farinosa *Forsk.* Shrub, 4 ft. Turkana Desert, between Kapenguria and Lodwar.............................. 1568
cfr. Cadaba rotundifolia *Forsk.* (appendix ligulate), 8 ft. Lake Rudolf, Ferguson's Bay.............................. 1617

MAERUA.

KENYA.

Maerua sp. (Fruit torulose, glabrous, no leaves, calyx glabrous). Fifty-six miles north of Isiola, shrub, 10 ft.................. 1236
Maerua sp. cfr. M. rigida *R. Br.* (calyx pubescent, leaves simple). Fifty-six miles north of Isiola, shrub, 10 ft......... 1237
Maerua sp. (Leaves 3–5 foliolate). Tree, 20 ft. Mountain slopes Mount Elgon.. 1505

CRASSULACEAE.

KALANCHOE.

SOUTHERN RHODESIA.

Kalanchoe sp. Flowers white, raceme $3\frac{1}{2}$ ft. long. Six miles east of Lundi Hotel, hill slopes.......................... 456

TANGANYIKA.

Kalanchoe somaliensis *Bkr.* Flowers white. Oldango.......... 1018

PITTOSPORACEAE.

PITTOSPORUM.

KENYA.

Pittosporum abyssinicum *Delile.* Growing in bush north of Nanyuki.. 1217

BELGIAN CONGO.

Pittosporum abyssinicum *Delile.* Along Lake Kivu, near Sake 1788

HAMAMELIDACEAE.

TRICHOCLADUS.

KENYA.

Trichocladus sp. (?) (leaves only). Shrub, 8 ft. Eight miles north of Nyeri.. 1190

Trichocladus malosanus *Bak.* Tree, 15 ft. Thompson's Falls.... 1312

Trichocladus malosanus *Bak.* Tree, 15 ft. Slopes of Mount Elgon 1502

ROSACEAE.

ALCHEMILLA.

KENYA.

Alchemilla sp. (cfr. A. abyssinica or A. Lovenii). Thompson's Falls.. 1355

PARINARI.

NYASALAND.

Prob. Parinari curatellifolium *Pl.* Tree, 30 ft. Forty miles north of Dwanga.................................... 628

TANGANYIKA.

Parinari sp. (cf. P. curallelifolium *Pl.*). Tree, 20 ft. Lower parts Toroto Range.................................. 765

SOUTHERN RHODESIA.

Parinari curatellifolium *Pl.* South-west of Enkeldoorn.......... 1913

LEGUMINOSAE.

ALBIZZIA.

NYASALAND.

Albizzia Harveyi *Fourn.* Tree, 25 ft. Three miles north of Rukuru River.................................. 684

Kenya.

Albizzia sp. Seventy miles north of Kapenguria, in desert, 30 ft., Poor specimen.......... 1631

Albizzia gummifera (*Gmel.*) *C. A. Sm.* Tree, 30 ft., at Meru.... 1221

Uganda.

Albizzia corriaria *Welw.* Tree, 30 ft. Lake George, Game Reserve.......... 1754

Belgian Congo.

Albizzia gummifera (*Gmel.*) *C. A. Sm.* Lake Kivu.......... 1818

ACACIA.

Portuguese East Africa.

Acacia sp. cfr. A. campylacantha *Hochst.* Tree, 30–40 ft. Zambesi Valley, 20 miles north of Villa Gouveir, on road to Tete...... 493

Acacia sp. Fourteen miles north of Dwanga River.......... 507

Acacia karroo *Hayne.* Forty-five miles north of Livubwe Rivei 523

Nyasaland.

Acacia albida *Del.* at Shiré River, 30–40 ft.......... 576

Acacia campylacantha *Hochst.* Tree, + 20 ft. Twenty miles north of Shiré River on road to Dedza.......... 579

Acacia lasiopetala *Oliv.*, 10–12 ft. Sixty miles north of Shire River on road to Dedza.......... 581

Acacia macrothyrsa *Harms.* Tree, 20 ft. Mzimba.......... 651

Acacia sp. Tree, 30 ft. Fifty-six miles north of Mzimba........ 657

Acacia arabica *L.* var. kraussiana *Bth.* Tree, 20 ft. Sixty-one miles north of Mzimba in plains.......... 658

Acacia sp. (slender branch, spines longer than leaves). Tree, 20 ft. Grassveld, 61 miles north of Mzimba.......... 659

Acacia campylacantha *Hochst.* Tree, 40 ft. Grass veld 8 miles south of Rukuru River.......... 680

Tanganyika.

cfr. Acacia abyssinica *Hochst.* Tree, 20–30 ft. Sao Highlands 36 miles north of Ikweia.......... 788

Acacia sp. cfr. A. detinens *Burch.* and A. mellifera *Bth.* Tree, 20–30 ft., 76 miles north of Iringa.......... 805

Acacia senegal *Willd.* Tree, 25 ft., 56 miles north of Dodoma.... 822

cfr. Acacia seyal *Del.* Shrub, 8 ft., at Mya.......... 827

Acacia sp. (cfr. A. Holstii *Taub.* Engl. Pfl. Ost. Afr. c. 194), flat top, 20 miles south of Mbulu on road to Arusha.......... 881

Acacia sp. (cfr. A. karroo.) Shrub, 5 ft., 1 mile north Babati, near Lake.......... 855

Acacia xanthophloea *Bth.*, 25 ft., 25 miles north of Mbulu........ 891

KENYA.

Acacia pennata *Willd.* Machakos Yatta Plains................ 1079
Acacia senegal *Willd.* Machakos Yatta Plains................. 1081
cfr. Acacia spirocarpa *Hochst.* Machakos, Yatta Plains.......... 1098
Acacia senegal *Willd.* (?) Shrub, 10 ft., 65 miles north of Isiola... 1248
Acacia sp. (no flowers or fruit). Bush, 10 ft., 70 miles north of Isiola.. 1250
Acacia Lahai *Steud. & Hochst.*, ex descr. Thompson's Falls..... 1331
cfr. Acacia Gerrardi *Bth.* Near Nakuru....................... 1379
Acacia pennata *Willd.* Eighty-eight miles north of Kapenguria.. 1542
cfr. Acacia Asak *Willd.* (= A. Hunteri Ic. Pl. T. 1350). Turkana Desert, between Lokitaung and Lodwar.................... 1601
Acacia macrothyrsa *Harms.* Six miles north of Kapenguria..... 1638
Acacia pennata *Willd.* Bush, 8 ft., Kamasia Reserve, open plains 1415
Acacia sp. (not matched). cfr. A. erubescens. Tree, 15 ft., Kamasia Reserve....................................... 1423
Acacia lasiopetala *Oliv.* (?) (pods required). Tree, 15 ft., Molo River, Kamasia Reserve................................ 1429
cfr. Acacia Gerrardi *Bth.* Kamasia Reserve................... 1430
Acacia sp. Prob. A. karroo but leaflets small. Shrub, 10 ft., Kamasia Reserve....................................... 1431

DICHROSTACHYS.

NYASALAND.

Dichrostachys glomerata *Hutch. & Dalziel* forma. Shrub, 12 ft., Chimungo (?) Hills, 3 miles north of Ekwendeni............ 667

TANGANYIKA.

Dichrostachys glomerata *Hutch. & Dalziel*, forma, 15 ft., between Nembula and Ikwera (?)................................ 777

COPAIFERA.

PORTUGUESE EAST AFRICA.

Copaifera mopane *Kirk.* Tree 30–40 ft. Zambesi Valley, 14 miles north of Dwenga River................................ 504

CYNOMETRA.

UGANDA.

Cynometra sp. (leaves only). Tree, 50 ft., Eturi Forest.......... 1726

ENTADA.

TANGANYIKA.

Entada abyssinica *Steud.* Tree, 20 ft., plains between Tukuyu and Mbeya Mountains................................ 702

KENYA.

Entada sp. cfr. E. abyssinica *Steud.* Tree, 20 ft., Bukura Farm 1652
Entada abyssinica *Steud.* Tree, 15 ft., 6 miles north of Kapenguria 1515

UGANDA.

Entada abyssinica *Steud.* Tree, 30 ft., hills 26 miles south of Fort Portal.. 1751

PIPTADENIA.

KENYA.

cfr. Piptadenia sp. Tree, 40 ft., on river banks at Thika......... 1162

BRACHYSTEGIA.

PORTUGUESE EAST AFRICA.

Brachystegia sp. (?) (leaves only). Common tree in forest 8 miles north of Pungwe River on road to Villa Gouveia............ 480

NYASALAND.

Brachystegia sp. (?) (leaves only). Tree, 40 ft., 5 miles north of Shiré River.. 535

Brachystegia sp. (?) Tree, about 30 ft., at Mzimba.............. 648

Brachystegia sp. Tree, 25 ft., 29 miles north of Rukuru River.... 691

TANGANYIKA.

Brachystegia sp. Tree, 40 ft., Tukuyu (?) Mountain, near Mbeya 717

Brachystegia macrophylla *Harms.* Tree, 30 ft., Highland plains (Sao), 30 miles north of Ikwera (?)........................ 787

TAMARINDUS.

cfr. Tamarindus sp.. *No number*

BERLINIA or ISOBERLINIA.

NYASALAND.

Berlinia paniculata *Bth.* (i.e., Isoberlinia paniculata *Hutch.*) Tree, 30 ft., growing in forest at Mzimba.................. 649

Berlinia paniculata *Bth.* (I. paniculata *Hutch.*). Tree, 20 ft., in plains 53 miles north of Lilongwe...................... 609

Berlinia paniculata *Bth.* (I. paniculata *Hutch.*) Cut-down tree in grassveld 10 miles north of Fort Hill.................... 708

Berlinia tomentosa *Harms.* (I. tomentosa *Hutch*). Cut-down tree 10 miles north of Fort Hill.......................... 709

Berlinia sp. (leaves only). Tree, 30 ft., in forest, 29 miles north of Rukuru.. 690

BELGIAN CONGO.

cfr. Berlina sp. (but note bracts enclose the bud and leaves appear to be imparipinnate. One large petal, 5 small ones and 5 calyx lobes). Tree 30 ft. Costermansville to Kamitya............. 1821

BERLINIA (?) BRACHYSTEGIA (?).

NYASALAND.

Very common tree on hills and plains, 30 ft., 53 miles north of Lilongwe.. 608

BAUHINIA.

PORTUGUESE EAST AFRICA.

Bauhinia Galpinii *N.E. Br.* Thirty-one miles north-east of Macequece.. 471

Nyasaland.

Bauhinia sp. Fifteen ft., 5 miles north of Mkulumatzi River..... 534
Bauhinia Thonningii *Schum.* Tree, 10–15 ft., 61 miles north of Mzimba.. 660

Kenya.

Bauhinia tomentosa *L.* (?) Shrub, 10 ft., flowers yellow. Along stream at Marsabit.. 1254
Bauhinia Thonningii *Schum.* Tree, 20 ft., 11 miles north of Kapenguria.. 1517
Bauhinia sp. Creeper with yellow flowers, grassveld, between Kipkorren and Kakamega (?)............................. 1640

Belgian Congo.

Bauhinia Gossweileri *Bkr.* ex descr. Creeper, flowers white, 11 miles south of Itula.. 1825
Bauhinia sp. (?) Pods only. Tree, 40 ft., 5 miles south of Kabongo.. 1857

CASSIA.

Portuguese East Africa.

Cassia delagoensis *Harv.* Forty-five miles north-east of Macequece 478
Cassia goratensis *Fresn.* Zambesi, near Tete.................. 511

Tanganyika.

Cassia goratensis *Fresn.* (= *Milne-Redhead* 1208). Shrub, 10 ft., thorn country, 4 miles north of Iringa..................... 806
Cassia didymobotrya *Fresn.* Eleven miles north of Bubu River to Arusha.. 830
Cassia sp. (prob. C. didymobotrya, but with shaggy pod), 15 miles south of Hanang.. 882

Kenya.

Cassia mimosoides *L.* Thompson's Falls....................... 1302
Cassia obovata *Collad.* Turkana Desert....................... 1603

DELONIX (POINCIANA).

Kenya.

Delonix elata *Gamble* ex descr. = Poinciana elata *L.* Mountain, edge of Turkana Desert...................................... 1551

CORDYLA.

Portuguese East Africa.

Cordyla sp. (leaves only). Four miles north of Livubwe River.... 518

AFRORMOSIA.

Portuguese East Africa.

Afrormosia angolensis *Harms.* Twenty-five miles north of Villa Gouveia.. 496

NYASALAND.

Afrormosia sp. (leaves only). Shrub, 12 ft., 29 miles north of the Rukuru River.. 692

BAPHIA.

NYASALAND.

Baphia sp. (?) 3 ft., hill slopes near Dedza.................... 596

UGANDA.

Baphia sp. cfr. B. Wallastoni *Bak.*, f. Journ. Linn. Soc. xxxviii. Tree, 15 ft., Eturi Forest................................ 1723

Baphia sp. (not matched, petioles long). Tree, 30 ft., Eturi Forest 1746

LOTONONIS.

KENYA.

Lotononis sp. Creeping in old cultivated lands. Wakamba Reserve.. 1124

SWARTZIA.

PORTUGUESE EAST AFRICA.

Swartzia sp. (?) (leaves only). Eight miles north of Pingwe River 482

NYASALAND.

Swartzia madagascariensis *Desv.* Three miles north of Malange on road to Limbe.................................... 555

CROTALARIA.

PORTUGUESE EAST AFRICA.

Crotalaria virgulata *Klotzsch.* Shrub, 5 ft., 52 miles north of Livubwe River.. 524

Crotalaria natalitia *Meisn.* Shrub, 5 ft., 55 miles north of Livubwe River.. 525

NYASALAND.

Crotalaria rhodesiae *Bkr. f.* In vleis, 15 miles north of Dwanga (?) 623

Crotalaria sp. cfr. C. rotundicarinata *Bkr. f.*, but inflorescence appears, several flowered. cfr. C. harmsiana but leaves not sub-sessile. Near Fort Hill............................ 707

TANGANYIKA.

cfr. Crotalaria lachnosema *Stapf.* Thirty-five miles north of Nyambe Road near Nembula............................ 781

cfr. Crotalaria longidens *Burtt Davy* ex *Verdoorn.* Shrub, 4 ft., 5 miles north of Babati................................ 856

Crotalaria agatiflora *Schweinf.* (but with longer leaflets). Tree, 8 ft., 24 miles north of Babati............................ 864

Crotalaria sp. (leaves only). Shrub, 10 ft., Ngorongoro Crater.... 917

Crotalaria sp. (not matched) near C. cylindrocarpa *D.C.*, 24 in. high, pods densely pubescent, Ngorongoro Crater........... 934

Crotalaria recta *Steud.* Shrub, 3 ft., Ngorongoro Crater......... 939

Crotalaria lotoides *Bth.* Upper slopes, Ngorongoro Crater....... 962
Crotalaria sp. Shrub 8 ft., Karatu.......................... 1002
Crotalaria oocarpa *Bkr.* Five miles north of Karatu............ 1003
Crotalaria sp., near C. striata but keels short and broad. In grass veld on road from Ngorongoro.......................... 1008
Crotalaria sp. cfr. C. pycnostacha *Bth.* On way to Arusha = Greenway 6758.................................. 1010
Crotalaria sp. cfr. C. gazensis *Bkr.* 9 in. high, 13 miles north of Arusha.. 1016
Crotalaria recta *Steud.* Shrub, 3 ft., 16 miles north of Arusha.... 1022
Crotalaria sp., near C. cleomifolia, but leaves 3- (not 5) foliolate. cfr. C. Keilii, 11 miles north of Arusha..................... 1027
Crotalaria polysperma *Kotsch.* Seventeen miles north of Arusha.. 1031

KENYA.

Crotalaria sp. cfr. C. saxatilis *Vatke.* Shrub, 4 ft., Machakos Yatta Plains... 1072
Crotalaria lotoides *Bth.* (distribution much wider than recorded). Machakos Yatta Plains.............................. 1073
Crotalaria lanceolata *E. Mey.* Thika, Fort Hall............... 1166
Crotalaria sp. Among grass, Thompson's Falls................ 1323
Crotalaria sp. (prob. C. emarginata *Bojer*). 24 ins. high, Thompson's Falls Camp....................................... 1335
Crotalaria sp. cfr. C. lachnocarpoides *Engl.* Twenty miles north of Kitali.. 1501
Crotalaria sp. cfr. C. Preladoi *Bkr. f.* (ex descr.). 6 in. high, Turkana Desert, between Kapenguria and Lodwar.......... 1605

UGANDA.

Crotalaria lanceolata *E. Mey.* Forty miles south of Kabongo.... 1869
Crotalaria cleomifolia *Welw.* (?)............................ *No number*

LUPINUS.

TANGANYIKA.

Lupinus sp. cfr. L. Princei *Harms.* 6 ins., 50 miles north of Babati on mountain range............................ 877

BELGIAN CONGO.

Lupinus sp. Luanda country, near Goma.................... 1795

TRIFOLIUM.

TANGANYIKA.

Trifolium sp. Creeping over grass. Flowers blue, Ngorongoro Crater... 899
Trifolium sp. cfr. Burchellianum *Ser.* 6 in. high, white flowers, Ngorongoro Crater................................. 900
Trifolium sp. Blue flowers, Ngorongoro Crater................. 951
Trifolium sp. cfr. Burchellianum *Ser.* White flowers, Ngorongoro Crater... 952
Trifolium usambarense *Taub.* ex *Engl.* On Ruwenzori mountain 1691

ARGYROLOBIUM.

NYASALAND.

Argyrolobium tomentosum (*Andrs.*) *Druce*. Twenty-five miles north of Ekwedeni 669

LOTUS.

TANGANYIKA.

Lotus sp. Ngorongoro Crater 927

INDIGOFERA.

NYASALAND.

Indigofera sp. Twenty-five miles north of Ekwedeni, 18 in. high 671

TANGANYIKA.

Indigofera Garckeana *Vatke*. 5 ft. high, between Mbeya and Kondoa Irangi 845

Indigofera neglecta *N.E. Br.* Flowers pink, upper slopes Ngorongoro Crater 965

KENYA.

Indigofera sp. Fifteen miles north of Nyeri (dry conditions) 1197

Indigofera sp. Creeper in crater near water at Marsabit 1270

Indigofera sp. River banks, Thompson's Falls 1291

Indigofera sp. River banks, Thompson's Falls 1292

Indigofera sp. (near I. suaveolens and I. ukekensis). With glands on calyx lobes. Fifteen miles east of Kericho 1463

Indigofera spinosa *Forsk.* Lake Rudolf 1589

Indigofera subulata *Vahl.* Fourteen miles north of Kitale 1494

Indigofera sp. (not matched). Turkana Desert, between Lokitaung and Lodwar, 8 ft. high 1604

TEPHROSIA.

PORTUGUESE EAST AFRICA.

Tephrosia acaciaefolia *Welw.* 12 in. high, 10 miles north of Villa Gouveia on way to Tete 491A

NYASALAND.

Tephrosia sp. (?) Twenty-five miles north of Ekwedeni 670

TANGANYIKA.

Tephrosia zombensis *Bkr.* (between Nembula and Ikwera). + 35 miles north of Nyambi 780

KENYA.

Tephrosia sp. cfr. T. rigida *Bkr.* Shrub 8 ft. 6 miles north of Kapenguria 1511

Tephrosia sp. cfr. T. athiensis *Bak. f.* Thompson's Falls 1363

UGANDA.

Tephrosia Vogelii *Hook f.* Shrub, 6 ft., on Ruwenzori mountains 1713

MUNDULEA.

NYASALAND.

Mundulea sericea (*Willd.*) *Chev.*, near Mkulumatzi River 531
Mundulea sericea (*Willd.*) *Chev.*, 5 miles south-east of Limbe 536

TANGANYIKA.

Mundulea sericea (*Willd.*) *Chev.*, 26 miles north of Dodoma 821

MILLETTIA.

BELGIAN CONGO.

cfr. Millettia drastica *Welw.* Between Katchi and Kabongo 1849
cfr. Millettia drastica *Welw.* Five miles south of Kabongo 1856

SESBANIA.

KENYA.

Sesbania aegyptiaca *Poir* (?). Inflorescence 2-flowered, and flowers over 2 cm. long. Nanyiki 1202
cfr. Sesbania Goetzei *Harms.* Lake Nakuru 1410

ASTRAGALUS.

TANGANYIKA.

Astragalus abyssinicus *Steud.* Ngorongoro Crater 953

AESCHYNOMENE.

NYASALAND.

Aeschynomene mimosifolia *Vatke.* Ten miles south of Mzimba ... 647

KENYA.

Aeschynomene sp. Vlei near Isiola 1393

UGANDA.

Aeschynomene elaphroxylon *Taub.* (âmbatch). Lake Victoria, near Koga 1674

SMITHIA.

NYASALAND.

Smithia strigosa *Bth.*, about 18 miles north-east of Mzimba 647A

TANGANYIKA.

Smithia eylesii *S. Moore.* Small plant, 4 ft., about 20 miles north of Ikwera 786
Smithia thymodora *Bak.* (?) Shrub, 10 ft., about 37 miles north of Ikwera 792
Smithia aeschynomenoides *Welw.* (?) Shrub, 10 ft., about 37 miles north of Ikwera 793

ORMOCARPUM.

NYASALAND.

Ormocarpum Kirkii *S. Moore.* Shrub, 3 ft., 10 miles north of Dwanga River 618

KENYA.

Ormocarpum trichocarpum *Burtt-Davy*. Shrub, 10 ft., 88 miles north of Kapenguria.................................... 1538

GEISSASPIS.

NYASALAND.

Geissaspis sp. Shrub, 2 ft., 74 miles north of Dwanga........... 638

ZORNIA.

KENYA.

Zornia tetraphylla *Michaux* forma (leaves shorter and broader than typical). Aberdare Range......................... 1376

PSEUDARTHRIA.

KENYA.

Pseudarthria Hookeri *Wight & Arn.* From Lady Jacques Blake, Nairobi.. 1208

ALYSICARPUS.

KENYA.

Alysicarpus sp. Plant, 6 in. high, at Rumuruti................. 1361A

DALBERGIA.

PORTUGUESE EAST AFRICA.

Dalbergia melanoxylon *G. & P.* Shrub, 10–12 ft., 14 miles north of Dwenga River.................................... 503

PTEROCARPUS.

BELGIAN CONGO.

Pterocarpus sp. (?) cfr. P. soyauxii *Taub.* (leaves only). Kabongo 1854

LONCHOCARPUS.

NYASALAND.

Lonchocarpus sp. Tree, 20 ft., 1 mile north of Rukuru River...... 683

OSTRYODERRIS.

NYASALAND.

Ostryoderris sp. cfr. Pole Evans 2789. Eight miles north of Lilongwe.. 601

TANGANYIKA.

Ostryoderris Stuhlmannii *Dunn.* Tree, 25 ft., 7 miles north of Dodoma.. 814

VICIA.

TANGANYIKA.

Vicia sp. cfr. V. paucifolia *Bkr.* Upper ridge, Ngorongoro Crater.. 954

ERYTHRINA.

NYASALAND.

Erythrina tomentosa *R. Br.* ex *A. Rich.* Twenty-four miles north of Lilongwe.. 603

KENYA.

Erythrina tomentosa *R. Br.* ex *A. Rich.* Masai Reserve, at Satik 1439

UGANDA.

Erythrina sp., cfr. E. tomentosa *R. Br.* ex *A. Rich.* = *M. Mucke* 374. Thirty miles south of Mitiyana...................... 1684

BELGIAN CONGO.

Erythrina tomentosa *R. Br.* ex *A. Rich.* Lake Kivu, near Sake.. 1784

MUCUNA.

PORTUGUESE EAST AFRICA.

Mucuna coriacea *Bkr.* Eight miles north of Pungwe River...... 479

NYASALAND.

Mucuna coriacea *Bkr.* Creeper, 40 miles south of Blantyre, near Cholo.. 541

Mucuna sp. Twenty-five miles north of Mzimba............... 655A

RHYNCHOSIA.

NYASALAND.

Rhynchosia resinosa *Bkr.* Fifteen miles north of Rukuru River.. 689

TANGANYIKA.

Rhynchosia sp. Growing in grass, Ngorongoro Crater............ 937

KENYA.

Rhynchosia sp. 6 ft. tall, near Fort Hall...................... 1167

Rhynchosia sp. Creeping in grass, near Fort Hall.............. 1171

ERIOSEMA.

TANGANYIKA.

Eriosema sp. Among grass, Ngorongoro Crater................. 938

PHASEOLUS.

SOUTHERN RHODESIA.

cfr. Phaseolus Schimperi *Taub.* Ten miles south of Broken Hill.. 1903

SPHENOSTYLIS.

TANGANYIKA.

Sphenostylis erecta *Hutch.* Ten miles south of Broken Hill...... 1902

DOLICHOS.

TANGANYIKA.

Dolichos lablab *L.* Among tall grass. Toroto Range........... 751

Dolichos sp. (?) (not matched). Shrub, 6 ft., edge Ngorongoro Crater.. 896

KENYA.

Dolichos axillaris *E. Mey.* Twining, in bush, north of Nanyuki.. 1215

Dolichos sp. (not matched). Fourteen miles north of Meru...... 1227

Dolichos sp. Blue flowers, 105 miles north of Kapenguria........ 1550

Dolichos sp. (not matched). Edge of Turkana Desert........... 1560

BELGIAN CONGO.

Dolichos Buchanani *Harms.* (?) Near Sungu Mungu............ 1881

Dolichos sp. (very poor specimen). Near Jadotville............. 1897

LEGUMINOSAE INDET.

PORTUGUESE EAST AFRICA.

Edge of forest, shrub ± 8 ft. Leaves pinnate up to 7 in. long, leaflets ± 1 in. long and about ½ in. broad; 35 miles north-east of Macequece.. 474

NYASALAND.

Tree, 15–20 ft. Leaves pinnate ± 3 in. long, leaflets under ½ in. long and $^{1}/_{10}$ in. broad; 53 miles north of Dwanga........... 632

TANGANYIKA.

Pods with grooved valves. Twenty miles north of Dodoma..... 817

UGANDA.

Plant, 4 in. high, at Koga, Lake Victoria..................... 1675

GERANIACEAE.

PELARGONIUM.

TANGANYIKA.

Pelargonium sp. aff. P. alchemilloides. On mountain range ± 40 miles north of Babati................................ 874

KENYA.

Pelargonium multibracteatum *Hochst.* Flowers white, 10 miles north of Kapenguria. Figured for "Fl. Pl. of South Africa," t. 794.. 1636

GERANIUM.

TANGANYIKA.

Geranium aculeolatum *Oliv.* Ngorongoro Crater............... 956A

Geranium simense *Hochst.* Ngorongoro Crater................. 956

ZYGOPHYLLUM.

KENYA.

Zygophyllum simplex *L.* Turkana Desert between Kapenguria and Lodwar, sandy soil.................................. 160

BALANITES.

TANGANYIKA.

Balanites sp. Near B. australis *Bremekamp.* Tree, 25 ft., near Arusha.. 1012

RUTACEAE.

FAGARA.

KENYA.

Fagara sp. Eighty-eight miles north of Kapenguria............ 1537
Fagara sp. Eighty-eight miles north of Kapenguria............ 1541

TODDALIA.

KENYA.

Toddalia asiatica *Lam.* 15 ft., Mount Elgon.................. 1506

CLAUSENA.

BELGIAN CONGO.

Clausena anisata *Oliv.* 4 ft., south of Kabongo................ 1863

SIMARUBACEAE.

HARRISONIA.

KENYA.

Harrisonia abyssinica *Oliv.* Shrub, 8 ft., on hills near Kisumu.... 1648

BURSERACEAE.

COMMIPHORA.

KENYA.

Commiphora sp. (no leaves). Tree, 15 ft., on Machakos Yatta Plains.. 1074
Commiphora sp. (?) Sixty-two miles north of Isiola............ 1241
Commiphora sp. cfr. C. calciicola and C. pilosa. Eleven miles north of Kapenguria, at Suan River..................... 1518

MELIACEAE.

EKEBERGIA.

BELGIAN CONGO.

Ekebergia arborea *Bkr. f.* Tree, 15 ft., five miles south of Kabongo 1858
Ekebergia sp. Tree, 15 ft., south of Libudi.................... 1890

TRICHILIA.

PORTUGUESE EAST AFRICA.

Trichilia sp. (leaves only). Tree, 20 ft., 35 miles north of Livubwe River.. 522

KENYA.

Trichilia sp. Possibly T. emetica *Vahl.* Tree, 40–50 ft., under moist conditions at Meru.............................. 1222

MALPIGHIACEAE.

ACRIDOCARPUS.

BELGIAN CONGO.

Acridocarpus sp. (?) (Shape and length of wings differ from those of species seen.) Tree, 15 ft., near Sungu Mungu...... 1880

POLYGALACEAE.

POLYGALA.

NYASALAND.

Polygala sp. cfr. P. Gomesiana. 5 ft. high, blue flowers, 47 miles north of Katunga.................................. 701
Polygala sp. = Greenway 820 named " nr. P. gomesiana *Welw.*" Seventy-four miles north of Dwanga........................ 637

BELGIAN CONGO.

Polygala sp. (poor specimen). Tree, 20 ft., west of Katchi....... 1837

SECURIDACA.

BELGIAN CONGO.

Securidaca longipedunculata *Fres.* Tree, 20 ft., Sungu Mungu.... 1885

EUPHORBIACEAE.

PSEUDOLACHNOSTYLIS.

NYASALAND.

Pseudolachnostylis Dekindtii *Pax.* Three miles north of Milange 556

BELGIAN CONGO.

Pseudolachnostylis maprouneaefolia *Pax.* Between Katchi and Kabongo.. 1845

HYMENOCARDIA.

BELGIAN CONGO.

Hymenocardia acida *Tul.* (*See* Trans. Linn. Soc. xxix, t. 94.) Tree, 10 ft., 5 miles south of Kabongo..................... 1852

UAPACA.

PORTUGUESE EAST AFRICA.

Uapaca sansibarica *Pax.* Tree, 30 ft., 27 miles, Pungwe River, on road to Villa Gouveia................................ 489

NYASALAND.

Uapaca kirkiana *Mull. Arg.* On Zomba Plateau................. 568
Uapaca nitida *Mull. Arg.* Fifty-three miles north of Lilongwe... 611
Uapaca pilosa *Hutch.* Ten miles north of Fort Hill............. 710

BELGIAN CONGO.

Uapaca sp. Near Libudi.. 1889

BRIDELIA.

NYASALAND.

Bridelia micrantha *Baill.* (leaves only). Ten miles south of Zomba 572

KENYA.

Bridelia scleroneuroides *Pax* ex descr. 10 ft., Machakos Yatta Plains.. 1082
Bridelia scleroneuroides *Pax* ex descr. Eleven miles north of Kapenguria... 1519

Belgian Congo.

Bridelia Ferruginea *Bth.* Tree, 10 ft., 5 miles south of Kabongo.. 1851

CROTON.

Tanganyika.

Croton sp. (probably C. macrostachys *Hochst.* ex *A. Rich.*) (leaves only). Seven miles north of Arusha................ 1023

Kenya.

Croton megalocarpus *Hutch.* Shrub, 10–15 ft., Machakos Camba Reserve.. 1116
Croton pseudopulchellus *Pax.* Shrub, 5 ft., Machakos Camba Reserve.. 1118
Croton sp. Shrub, 8 ft., Marsabit Northern Frontier............ 1263
Croton sylvaticus *Hochst.* Shrub, 10 ft., Mount Elgon.......... 1504

MACARANGA.

Nyasaland.

Macaranga sp. (leaves only). Tree, 30–40 ft., around Malange.... 551
Macaranga kilimandscharica *Pax.* Tree, 30 ft., Kilimanjaro..... 1048

ACALYPHA.

Kenya.

Acalypha sp. Bush, 3 ft., edge of Lake Hannington Reserve escarpment, Kamasai Reserve.......................... 1417
Acalypha fruticosa *Forsk.* Shrub, 5 ft., Turkana Desert, between Kapenguria and Lodwar................................ 1563
Acalypha sp. cfr. A. grantii *Bak. & Hutch.* ex descr. 2 ft., bank of Turkwell River................................ 1632

GELONIUM.

Kenya.

Gelonium procerum *Prain.* Evergreen tree, 20 ft., near Kabete.. 1135

JATROPHA.

Kenya.

Jatropha sp. Turkana Desert.............................. 1569
Jatropha sp. Lake Rudolph............................... 1619
Jatropha fissispina *Pax.* ex descr. Near Lokitaung............. 1586

CLUYTIA.

Tanganyika.

Cluytia robusta *Pax.* (?) Plant, 7 ft., on Toroto Range.......... 757
Cluytia sp. Plant, 8 ft., Ngorongoro Crater..................... 909
Cluytia mollis *Pax.* 3 ft., eastern slopes Kilimanjaro........... 1047

Kenya.

Cluytia sp. Shrub, 5 ft., Thompson's Falls...................... 1316

MAPROUNEA.

BELGIAN CONGO.

Maprounea africana *Mull. Arg.* Tree, 20 ft., 5 miles south of Kabongo.................................... 1853

MONADENIUM.

TANGANYIKA.

Monadenium magnificum *E. A. Bruce* (?). Thirty-seven miles north of Iringa on mountains........................... 811

EUPHORBIA.

TANGANYIKA.

Euphorbia ussanguensis *N.E. Br.* ex descr. Tree, 12 ft., about 20 miles north of Poroto Range......................... 766
Euphorbia bilocularis *N.E. Br.* ex descr. Five miles north of Chimola River.. 771
Euphorbia sp. aff. E. contraversa *N. E. Br.* Hill slopes Kondoa Irangi.. 831
Euphorbia Grantii *Oliv.* Hills, Kondoa Irangi................. 844

KENYA.

Euphorbia sp. aff. E. brevis *N. E. Br.* Fifteen miles south of Isiola... 1281
Euphorbia sp. Escarpment above Lake Hannington............ 1419
Euphorbia heterochroma *Pax* ex descr. Forty-five miles north of Kapenguria... 1531
Euphorbia sp. (no inflorescence). Forty-five miles north of Kapenguria... 1532
Euphorbia breviarticulata *Pax.* Turkana Desert............... 1565
Euphorbia grandicornis *Pax.* Turkana Desert.................. 1566
Euphorbia triaculeata *Forsk.* ex descr. Thirty-five miles south of Lokitaung... 1590
Euphorbia sp. Escarpment above Turkana Desert............. 1616
Euphorbia cuneata *Vahl.* Turkana Desert...................... 1571

BELGIAN CONGO.

Euphorbiaceae. Tree, 20 ft., 40 miles south of Kabongo 1867

ANCARDIACEAE.

PSEUDOSPONDIAS.

UGANDA.

Pseudospondias microcarpa (*Rich.*) *Engl.* (= Spondias microcarpa *Rich.*). Thirty-seven miles south-west of Busia....... 1666

LANNEA.

KENYA.

Lannea humilis *Oliv.* (?). Small tree, 10 ft., 25 miles north of Kapenguria, on plains.................................. 1523
Lannea sp. cfr. Lannea fulva *Engl.* (See also Lanneoma velutina *Delile.*) Leaves appear to be 3-foliolate sometimes ; 37 miles north of Kapenguria..................................... 1529
Lannea sp. cfr. Lannea fulva *Engl.* (Probably = I. B. P.-E. and J. Erens 1529). Tree, 20 ft., plains, Kapenguria........ 1536

SORINDEIA.

BELGIAN CONGO.

Sorindeia sp. 15 ft., between Libode and Jadotville............ 1895

HEERIA.

TANGANYIKA.

Heeria sp. Tree, 15 ft., 30 miles north of the Poroto Range...... 768

KENYA.

Heeria sp. Tree, 15 ft., 6 miles north of Kapenguria............ 1516

RHUS.

TANGANYIKA.

Rhus sp. (not matched). Fifteen miles north of Kondoa Iringa.. 834
Rhus sp. (not matched). Near Mbulu......................... 884A
Rhus sp. cfr. R. glaucescens ex descr. Evergreen, 15 ft., inner slopes Ngorongoro Crater............................... 911

KENYA.

Rhus sp. cfr. R. glaucescens or R. lucens *Hutch.* Tree, 20 ft., 50 miles north of Namanga River......................... 1061
Rhus sp. cfr. R. villosa forma. Shrub, 6 ft., 39 miles north of Nanyuki.. 1204
Rhus sp. cfr. R. villosa *L. f.* Shrub, 10 ft., Thompson's Falls Camp... 1307
Rhus sp. cfr. R. glaucescens *Rich.* Tree, 15 ft., Thompson's Falls Camp... 1321
Rhus sp. cfr. R. villosa *L. f.* Shrub, 10 ft., at Satik............ 1443
Rhus sp. cfr. R. glaucescens *Rich.* Shrub, 5 ft., 88 miles north of Kapenguria.. 1539

BELGIAN CONGO.

Rhus sp. (not matched). Fruit about 2 mm. diam. Shrub, 8–10 ft. Lake Kivu to Sake................................ 1789

CELASTRACEAE.

GYMNOSPORIA.

KENYA.

Gymnosporia harveyana *Loes.* Thompson's Falls.............. 1306

CASSINE.

KENYA.

Cassine sp. Tree, 25 ft., at Thika Falls....................... 1163
Cassine sp. Tree, 15 ft., Thompson's Falls Camp............... 1308
Cassine sp. (?) (Prob. = No. 1308). Thompson's Falls Camp.... 1310
Cassine aethiopica *Thb.* Shrub, 8 ft., Turkwell River, on river banks.. 1634

HIPPOCRATACEAE.

HIPPOCRATEA.

TANGANYIKA.

Hippocratea sp. Seventy miles north of Dodoma............... 826

SAPINDACEAE.

ALLOPHYLUS.

KENYA.

Allophylus sp. cfr. A. melanocarpus (*Arn.*) *Radlk.* At Namanga River 1054

PAPPEA.

KENYA.

Pappea sp. (leaves only). Fifty miles north of Namanga River .. 1062
Pappea ugandensis *Bk. f.* (?) ex descr. Tree, 20 ft., Machakos Camba Reserve 1113

DODONAEA.

TANGANYIKA.

Dodonaea viscosa *L.* Thirty-seven miles north of Ikwera 791
Dodonaea viscosa *L.* Eight miles north of Kondoa Iringa 874

MELIANTHACEAE.

BERSAMA.

TANGANYIKA.

Bersama sp. Shrub, 8 ft., Ngorongoro Crater 915
Bersama sp. Shrub, 5 ft., Ngorongoro Crater 916

BALSAMINACEAE.

IMPATIENS.

NYASALAND.

Impatiens sp. Edge of forest, Malange 553
Impatiens sp. Herb, 9 ins., 25 miles north of Ekwendeni 673
Impatiens sp. Herb, 15 ins., 15 miles north of Katunga 703

TANGANYIKA.

Impatiens sp. Herb, 3 ft., Ngorongoro Crater 935

KENYA.

Impatiens sp. Thompson's Falls 1350
Impatiens elegantissima *Engl.* Five miles east of Kericho 1451

UGANDA.

Impatiens sp. (no flowers). Herb, 4 ft., pink flowers, edge of forest on Ruwenzori 1690

RHAMNACEAE.

ZIZYPHUS.

PORTUGUESE EAST AFRICA.

Zizyphus jujuba *Lam.* Tree, 20 ft., on plains Zambesi River 509
Zizyphus jujuba *Lam.* Tree, 30 ft., Livubwe River 513

NYASALAND.

Zizyphus jujuba *Lam.* Sixty-one miles north of Ekwedeni 662

Tanganyika.

Zizyphus jujuba *Lam.* Tree, 20 ft., 18 miles north of Kondoa Iringa.. 840

Kenya.

Zizyphus sp. Tree, 8 ft., banks of dry river, Turkana Desert..... 1593

SCUTIA.

Kenya.

Scutia myrtina (*Burm.*) *Kurz.* Shrub, 8 ft., 30 miles north of Namanga River.. 1065
Scutia sp. cfr. S. myrtina (*Burm.*) *Kurz.* 15 ft., Thompson's Falls Camp.. 1320
Scutia sp. cfr. S. myrtina (*Burm.*) *Kurz.* 10 ft., Mount Elgon.... 1508

RHAMNUS.

Kenya.

Rhamnus sp. cfr. R. Staddo *Rich.* and R. Deflersii *Schweinf.* Thompson's Falls Camp.. 1319
Rhamnus prinoides *L'Herit.* Shrub, 8 ft., at Satik.............. 1438

Belgian Congo.

Rhamnus prinoides *L'Herit.* Lake Kivu, near Sake............. 1792

HELINUS.

Tanganyika.

Helinus mystacinus *Hemsl.* Ngorongoro Crater................ 910

TILIACEAE.

SPARMANNIA.

Tanganyika.

Sparmannia sp. (not matched). 8 ft., upper slopes of Ngorongoro Crater.. 960

GREWIA.

Tanganyika.

Grewia flavescens *Juss.* 15 ft., north of Kondoa Iringa......... 842
Grewia similis *K. Sch.* (?) Red berries, Ngorongoro Crater, inner slopes.. 905

Kenya.

Grewia similis *K. Schum.* (?) Shrub, 10 ft., north of Nanyuki.... 1218
Grewia bicolor *Juss.* 10 ft., Kamasia Reserve, Lake Hannington escarpment.. 1418
Grewia sp. Short peduncle and pedicels (cfr. *Scheffler* 397), 88 miles north of Kapenguria.......................... 1540
Grewia villosa *Willd.* Shrub, 6 ft., Turkana Desert............ 1552

Uganda.

Grewia mollis *Juss* (?) (= Cons. of Forests Uganda, 17b). Tree, 30 ft. Eturi Forest.. 1745

TRIUMFETTA.

KENYA.

Triumfetta flavescens *Hook.* Edge of Turkana Desert........... 1553

UGANDA.

Triumfetta effusa *E. Mey.* (?) Ruwenzori Mountain........... 1692

MALVACEAE.

SIDA.

KENYA.

Sida Schimperiana *Hochst.* Maputa River, on grassy plains, Wakamba Reserve.................................... 1112

PAVONIA.

TANGANYIKA.

Pavonia sp. 8 ft. 25 miles north of Babati.................... 863
Pavonia sp Upper slopes Ngorongoro Crater.................. 959

HIBISCUS.

TANGANYIKA.

Hibiscus cannabinus *L.* (= Greenway 4001). Twenty-six miles north of Dodoma.. 820
Hibiscus gossypinus *Thb.* Fifteen miles north of Kondoa Iringa 832
Hibiscus Ludwigii *E.* and *Z.* Ngorongoro Crater............... 957
Hibiscus diversifolius *Jacq.* Seven miles north of Arusha........ 1014
Hibiscus sp. (cfr. G. Milne 9). Shrub, 4 ft., flowers white, 15 miles north of Longido.................................... 1052

KENYA.

Hibiscus sp. (= No. 1052 but flowers red). Shrub, 6 ft., Kamasia Reserve, near Molo River................................ 1428
Hibiscus diversifolius *Jacq.* (?) Yellow flowers, 6 miles north of Timboroa.. 1470
Hibiscus micranthus *L.* f. Bush, 5 ft., edge Turkana............ 1556

KOSTELETZKYA.

KENYA.

Kosteletzkya sp. (ex descr.) Herb, 3 ft., between Sio River and Busia.. 1655

THESPESIA.

NYASALAND.

Thespesia Rogersii *S. Moore.* Three miles north of Ekwedeni.... 665

TANGANYIKA.

Thespesia sp. Fifteen miles north Nyambi road................ 774

BOMBACACEAE.

CEIBA (ERIODENDRON).

NYASALAND.

cfr. Ceiba (Eriodendron) pentandra *Gaertn.* (?) (In bud). Tree, 30 ft., 6 miles north of the Rukuru River.................. 688

DOMBEYA.

PORTUGUESE EAST AFRICA.

Dombeya sp. cfr. D. elegans *K. Sch.* Flowers white, 20 miles east of Macequece on road to Vanduzi..................... 467

NYASALAND.

Dombeya Burgessiae *Ger.* (?) On Zomba Plateau................ 565

TANGANYIKA.

Dombeya sp. (leaves only). Between Nembula and Ikwera...... 775
Dombeya sp. Forty-seven miles north of Babati................ 867
Dombeya sp. (leaves only). Edge Ngorongoro Crater........... 894

KENYA.

Dombeya rotundifolia *Harv.* On volcanic soil, 49 miles north of Nanyuki.. 1206
Dombeya sp. (leaves only) Marsabit......................... 1258

HERMANNIA.

KENYA.

Hermannia sp. (scrappy specimen). Turkana Desert, between Kapenguria and Lodwar.................................... 1607
Hermannia Oliveri *K. Schum.* Machakos Yatta Plains.......... 1083

DILLENIACEAE.

TETRACERA.

BELGIAN CONGO.

Tetracera masuiana *De Wild. & Dur.* Near Kabango........... 1847

OCHNACEAE.

OCHNA.

KENYA.

Ochna macrocalyx *Oliv.* (?) At Marsabit...................... 1268

BELGIAN CONGO.

Ochna sp. cfr. O. fruticulosa *Gilg.* ex descr. Seventy-three miles south of Kabongo.. 1873

GUTTIFERAE.

HYPERICUM.

TANGANYIKA.

Hypericum sp. Ngorongoro Crater........................... 926

KENYA.

Hypericum Roeperianum *Schimp.* North of Nanyuki........... 1214

UGANDA.

Hypericum leucoptychodes *Steud.* On Kegezi Mountain........ 1766

PSOROSPERMUM.

BELGIAN CONGO.

Psorospermum tenuifolium *Hook f.* (?) West of Katchi.......... 1838
Psorospermum tenuifolium *Hook. f.* (?) Between Katchi and Kabongo.. 1846
Psorospermum tenuifolium *Hook. f.* (?) Between Katchi and Kabongo.. 1850

GARCINIA.

Garcinia sp... *No number*

KENYA.

Garcinia Livingstonei *G. Anders.* At Thika.................... 1161

DIPTEROCARPACEAE.

MONOTES.

NYASALAND.

Monotes sp. cfr. M. africana and M. rufutomentosus (see Engl. Bot. Jahrb. xxviii, p. 137). North-east of Chimunga Hills... 676A

FLACOURTIACEAE.

TRIMERIA.

KENYA.

Trimeria Bakeri *Gilg.* Thompson's Falls Camp................. 1318
Trimeria Bakeri *Gilg.* Thompson's Falls Camp................. 1353

CALONCOBA.

BELGIAN CONGO.

Caloncoba sp. Tree, 20 ft., 9 miles south of Itula.............. 1824

FLACOURTIA.

NYASALAND.

Flacourtia hirtiuscula *Oliv.* Thirty-two miles north of Limbe.... 571
Flacourtia sp. (leaves only). Eighteen miles north of Mzimba.... 653

TANGANYIKA.

Flacourtia hirtiuscula *Oliv.* Between Nembula and Ikwera...... 776

KENYA.

Flacourtia sp. cfr. F. Kirkiana *Burtt-Davy.* Four miles north of Kitale.. 1492
Flacourtia hirtiuscula *Oliv.* Eleven miles north of Kapenguria... 1521

BELGIAN CONGO.

Flacourtia sp. Shrub, 10 ft., Lake Kivu, near Sake............. 1793

DOVYALIS.

Tanganyika.

Dovyalis sp. (?) Three miles south of Mbulu.................... 884

Kenya.

Dovyalis sp. cfr. D. abyssinica (*Reichb.*) *Warb.*, at Marsabit..... 1264
Dovyalis sp. cfr. D. abyssinica at Marsabit.................... 1269

PASSIFLORACEAE.

ADENIA.

Kenya.

Adenia globosa *Engl.* Athi River, Wakamba.................. 1106
Adenia sp. Between Kapenguria and Lodwar.................. 1567

THYMELIACEAE.

ARTHROSOLEN.

Nyasaland.

Arthrosolen dekindtiana *H. H. W. Pearson.* 1 ft. high, flowers red, 54 miles north of Mzimba................................ 668
Arthrosolen chrysantha *Solms-Laub.* ex *Schweinf.* Flowers yellow, 16 miles north of Fort Hill.............................. 714

Belgian Congo.

Arthrosolen dekindtiana *H. H. W. Pearson.* Between Libudi and Jadotville.. 1896

LASIOSIPHON.

Tanganyika.

Lasiosiphon Emini *Engl.* and *Gilg.* Thirty miles north of Iringa.. 801

Kenya.

Lasiosiphon Vatkei *Engl.* Wakamba Reserve................. 1119

RHIZOPHORACEAE.

CASSIPOUREA.

Tanganyika.

Cassipourea Elliotii *Alston* (male flowers). Edge of Ngorongoro Crater... 913

ANISOPHYLLEA.

Nyasaland.

Anisophyllea sp. cfr. Stolz. 1802. Tree, 20 ft., at Mzimba...... 650

COMBRETACEAE.

COMBRETUM.

Portuguese East Africa.

Combretum sp. (?) (leafy specimen only). Four miles north of Dwenga River.. 506
Combretum sp. (?) (leafy specimen only). Fourteen miles north of Dwenga River....................................... 508

Combretum sp. (?) cfr. C. ternifolium *Engl.* and *Diel.* Twenty miles north of Livubwe.................................. 520

NYASALAND.

Combretum sp. cfr. C. Zeyheri *Sond.* Ten miles north of Shiré River.. 537
Combretum sp. (leaves only). Ten miles north of Shiré River... 538
Combretum suluense *Engl.* and *Diels.* Eight miles north of Lilongwe.. 600
Combretum sp. Near C. holosericeum. Eight miles north of Lilongwe.. 602

TANGANYIKA.

Combretum sp. (leaves only). Between Tukuyu and Mbeya Mountain.. 719
Combretum sp. (prob. C. apiculatum *Sond.*) on Chimala River.... 770
Combretum sp. (abnormal fruits insect-galled). Six miles north of Chimala River.. 771
Combretum Zeyheri *Sond.* Seven miles north of Chimala River 772
Combretum sp. (leaves only). Five miles north of Nyambe Road 773
Combretum sp. cfr. C. holosericeum *Sond.* Between Nembula and Ikwera.. 779
Combretum holosericeum *Sond.* Between Nembula and Ikwera 782
Combretum Zeyheri *Sond.* Twenty-six miles north of Dodoma.. 818
Combretum sp. cfr. C. apiculatum *Sond.* Seventy miles north of Dodoma.. 825
Combretum sp. (leaves only). Fifteen miles north of Kondoa Iringa.. 841

KENYA.

Combretum suluense *Engl.* Tree, 15 ft., Machakos Yatta Plains 1078
Combretum sp. (cfr. C. suluense). Wakamba Reserve........... 1115
Combretum sp. (leaves only). On way to Isiola................ 1397
Combretum sp. (cfr. C. pachycarpum). In Warb. Kunene-Sambesie Ex., 15 miles north of Kitale.................... 1497
Combretum sp. (small leaves). Shrub, 8 ft., 65 miles north of Kapenguria.. 1533
Combretum sp. (not matched). Shrub, 4 ft., Turkana Desert... 1561
Combretum sp. (? = 1497.) Tree, 20 ft., Bukura Farm.......... 1654

BELGIAN CONGO.

Combretum racemosum *P. Beauv.* Between Itula and Kongolo 1829
Combretum sp. (?). Leaves only. Lake Kivu................. 1810

TERMINALIA.

PORTUGUESE EAST AFRICA.

Terminalia sp. Thirty-five miles north-east of Macequece....... 475
Terminalia sericea *Burch.* Twenty miles north of Livubwe River 519

NYASALAND.

Terminalia sp. cfr. T. torulosa, but petioles short, leaves only, 61 miles north of Mzimba.................................. 661

Terminalia sericea *Burch.* Three miles north of Rukuru River.... 685

KENYA.

Terminalia prunioides *Laws.* Thirty miles north of Iringa....... 800
Terminalia sp. cfr. T. Ruspolii *Engl.* and Diels, see *Engl.* Monog. IV. t. XV. B. Sixty-five miles north of Isiola........ 1247
Terminalia torulosa *F. Hoffm.* Fifteen miles north of Kitale..... 1498
Terminalia sp. Edge Turkana Desert........................ 1558A

UGANDA.

Terminalia sp. (?) cfr. T. glaucescens *Pl.* Ruwenzori Mountains 1719

MYRTACEAE.

SYZYGIUM.

NYASALAND.

Syzygium cordatum *Hochst.* Fifty miles north of Shirwa River on road to Dedza.................................... 585

TANGANYIKA.

Syzygium guineense (*Willd.*) *D. C.* Between Mbeya and Iringa, on Chimala River.................................... 769
Syzygium sp. (leaves only). Eighteen miles north of Kondoa Iringa... 839

KENYA.

Syzygium cordatum *Hochst.* Kamasia Reserve................ 1433
Syzygium sp. Probably S. guineense (*Willd.*) *D.C.* Fourteen miles north of Kitale.................................. 1493
Syzygium guineense (*Willd.*) *D.C.* Evergreen of $\pm$ 20 ft. Turkwel River... 1633

MELASTOMATACEAE.

DISSOTIS.

SOUTHERN RHODESIA.

Dissotis princeps (*Bonpl.*). Triana, two miles north of Zimbabwe 458

NYASALAND.

Dissotis princeps (*Bonpl.*). Triana. On Zomba Plateau........ 563

TANGANYIKA.

Dissotis sp., near D. Trothae *Gilg.* On Sao Highlands........... 796

ARALIACEAE.

CUSSONIA.

NYASALAND.

Cussonia sp. Forty-five miles north of Shiré River............. 580

ERICACEAE.

ERICINELLA.

TANGANYIKA.

Ericinella Mannii *Hook f.* Sao Highlands....................... 799

MYRSINACEAE.

MAESA.

BELGIAN CONGO.

Maesa lanceolata *Forsk.* Lake Kivu, near Sake................ 1791

MYRSINE.

KENYA.

Myrsine africana *L.* Thompson's Falls Camp.................. 315

SAPOTACEAE.

MIMUSOPS.

TANGANYIKA.

Mimusops sp. ± 37 miles north of Ikwera.................... 789

EBENACEAE.

ROYENA.

TANGANYIKA.

Royena sp. (not matched). Large fruit ± 2 cm. diam., tomentose, seven miles north of Bubu River on road to Arusha.......... 829

EUCLEA.

NYASALAND.

Euclea sp. (not matched). Three miles north of Bua River...... 617

TANGANYIKA.

Euclea sp. Six miles north of Ikwera.......................... 784
Euclea lanceolata *E. Mey.* On road to Arusha................. 880
Euclea sp. Three miles south of Mbulu....................... 885

KENYA.

Euclea lanceolata *E. Mey.* Fifty miles north of Namanga River 1060
Euclea sp. (leaves opp., possibly E. divinorum). Eight miles north of Nyeri.. 1189
Euclea sp. At Satik.. 1444
Euclea sp. At Satik.. 1445
Euclea sp. At Mount Elgon.................................1503

DIOSPYROS.

NYASALAND.

Diospyros Kirkii *Hiern.* Fifty-three miles north of Lilongwe.... 610
Diospyros sp. (?). cfr. D. squarrosa *Klotzsch.*, but calyx 5-lobed, Fr. 8-celled, 8-ovuled. Ten miles north of Dwanga River... 619

MABA.

KENYA.

Maba sp. From Lokitaung to Lake Rudolph................. *No number*

OLEACEAE.

OLEA.

TANGANYIKA.

Olea chrysophylla *Lam:* Ngorongoro Crater.................. 903

KENYA.

Olea chrysophylla *Lam.* Twenty-two miles north of Nanyuki.... 1284
Olea chrysophylla *Lam.* Thompson's Falls.................... 1317

BELGIAN CONGO.

Olea chrysophylla *Lam.* Near Lake Kivu, near Sake............ 1775

JASMINUM.

KENYA.

Jasminum sp. At Satik.................................... 1440
Jasminum mauritianum *Bojer.* Ninety-nine miles north of Kapenguria.. 1548

SALVADORA.

KENYA.

Salvadora persica *L.* Shrub, 10 ft., 60 miles north of Isiola...... 1238
Salvadora persica *L.* Turkwel River, Turkana Desert.......... 1572

LOGANIACEAE.

STRYCHNOS.

KENYA.

Strychnos sp. (not matched). Shrub, 5 ft. Calyx and corolla 5-lobed, ovary 2-celled. Escarpment, 10 miles north of Kapenguria.. 1635

LACHNOPYLIS.

KENYA.

Lachnopylis sp. cfr. L. congesta *R. Br.* North of Kisumu. Tree, 30 ft., growing in rich loam.......................... 1643

GENTIANACEAE.

SWEERTIA.

NYASALAND.

Sweertia Sharpei *N. E. Br.* Flowers whitish, plant 18 in. high, 15 miles north of Dwanga.............................. 627

KENYA.

Sweertia sp. (not matched). Two-fringed nectaries on each petal. Flowers blue. Burnt forest north of Timboroa...... 1474

APOCYNACEAE.

ACOKANTHERA.

KENYA.

Acokanthera Schimperi *Schweinf.* (ex descr.) at Ngong.......... 1128
Acokanthera Schimperi *Schweinf.* (ex descr.) at Kabete, near Nairobi.. 1136
Acokanthera Schimperi *Schweinf.* Forty-six miles north of Nanyuki.. 1205
Acokanthera Schimperi *Schweinf.* Twenty-seven miles north of Nanyuki.. 1286
Acokanthera Schimperi *Schweinf.* At Satik.................... 1442
Acokanthera Schimperi *Schweinf.* Marmanite Forest, near Thompson's Falls.. 1359

Southern Rhodesia.

Acokanthera venenata *G. Don.* Twenty-five miles south-west of Enkeldoorn 1912

CARISSA.

Kenya.

Carissa edulis *Vahl.* At Ngong 1139
Carissa edulis *Vahl.* At Thompson's Falls 1347

Belgian Congo.

Carissa edulis *Vahl.* At Lake Kivu, near Sake 1794

LANDOLPHIA.

Uganda.

Landolphia florida *Bth.*, var. leiantha *Oliv.* Forty-one miles south of Busia 1667

CARPODINUS.

Belgian Congo.

Carpodinus sp. (?) Near Sungu Mungu 1879

DIPLORRHYNCHUS.

Portuguese East Africa.

Diplorrhynchus mossambicensis *Bth.* Twenty-five miles north of Vila Gouveia 494

Kenya.

Diplorrhynchus sp. Tree, 20 ft., Maputa River, Wakamba Reserve 1114

ROUVOLFIA.

Kenya.

Rouvolfia caffra *Sond.* (= R. natalensis). At Meru 1225

ADENIUM.

Kenya.

Adenium sp. Fifty-six miles north of Isiola 1235
Adenium sp. cfr. A. speciosum *Fenzl.* (leaves with flowers but leaves narrow). Sixty-two miles north of Isiola northern frontier 1242
Adenium sp. Seventy miles north of Isiola northern frontier 1249

STROPHANTHUS.

Tanganyika.

Strophanthus Eminii *Asch. & Pax.* Seven miles north of Dodoma 813

Belgian Congo.

Strophanthus Welsitschii (*Baill.*) *K. Schum.* Nineteen miles south of Kabongo 1860
Strophanthus gardeniiflorus *Gilg.* Fifteen miles south of Sungu Mungu 1886

HOLARRHENA.

PORTUGUESE EAST AFRICA.

Holarrhena febrifuga *Klotzsch.* Four miles north of Livubwe River.. 518

ASCLEPIADACEAE.

PERIPLOCA.

KENYA.

Periploca leariifolia *Dill & Rich.* ex descr. Aberdaire Range... 1374

XYSMALOBIUM.

TANGANYIKA.

Xysmalobium undulatum *R. Br.* Upper slopes, Ngorongoro..... 963

ASCLEPIAS.

KENYA.

Asclepias rhacodes *N. E. Br.* ex descr. hear Lake Solai......... 1406

CALOTROPIS.

KENYA.

Calotropis procera (*L.*) *R. Br.* At Laisama, northern frontier.... 1253

CEROPEGIA.

KENYA.

Ceropegia sp. Aberdare Range.............................. 1373
Ceropegia sp. Eighty-eight miles north of Kapenguria.......... 1535

CARALLUMA.

KENYA.

Caralluma retrospiciens *N. E. Br.* Forty-two miles north of Lodwar, Turkana Desert.............................. 1581
Caralluma dummeri (*N. E. Br.*) *White* and *Sloane.* Athi River, Wakamba Reserve.................................... 1105
Caralluma turneri *E. A. Bruce.* North of Kapenguria........... 1526
Caralluma sp. cf. C. gracilipes *K. Sch.* Hills near Turkana Range.. 1575

CONVOLVULACEAE.

HILDEBRANDTIA.

KENYA.

Hildebrandtia obcordata *S. Moore.* Edge Turkana Desert........ 1554
Hildebrandtia obcordata *S. Moore.* Sixty-five miles north of Kapenguria.. 1534

ASTROCHLAENA.

NYASALAND.

Astrochlaena grantii *Rendle* (?) Two miles north of Shiré River, on road to Dedza.................................... 577

TANGANYIKA.

Astrochlaena hyoscyamoides *Hall. f.* Flowers white with blue centre ; 26 miles north of Dodoma...................... 819

Rhodesia.

Astrochlaena stuhlmannii *Hall. f.* Ten miles south of Broken Hill 1904

IPOMOEA.

Nyasaland.

Ipomoea sp. Twenty miles south of Lilongwe.................. 612

Tanganyika.

Ipomoea sp. (fruiting twigs only). Between Dodoma and Mya... 843
Ipomoea sp. White flowers, ± 21 miles north of Babati........ 865
Ipomoea sp. (Not matched). Arusha to Kilimanjaro............. 1036
Ipomoea sp. (fruiting specimen only). Machakos Yatta plains... 1075
Ipomoea sp. (prob. I. nyikensis *Hall. f.*) Machakos Yatta Plains 1085
Ipomoea sp. Affin. I. cicatrosa *Bak.* ex descr.) Twenty-five miles north of Isiola.................................... 1232
Ipomoea sp. (poor specimen). Eleven miles north of Kapenguria 1520

BORAGINACEAE.

CORDIA.

Tanganyika.

Cordia Holstii *Gurke.* Twenty-seven miles north of Kondoa Iringa 853
Cordia ovalis *R. Br.* Mountain range 45 miles north of Babati... 866
Cordia sp. Prob. C. ovalis *R. Br.* North of Babati............ 880A

Kenya.

Cordia Rolstii *Gürke.* Between Fort Hall and Nyeri........... 1176
Cordia gharaf (*Forsk.*) *Ehrenb.* Sixty-three miles north of Isiola 1245
Cordia gharaf (*Forsk.*) *Ehrenb.* Turkana Desert, between Kapenguria and Lodwar.. 1566

EHRETIA.

Kenya.

Ehretia sp. (not matched). Near Thompson's Falls............ 1356

HELIOTROPIUM.

Tanganyika.

Heliotropium steudneri *Vatke.* Seven miles north of Arusha.... 1015

Kenya.

Heliotropium strigosum *Willd.* Turkana Desert, between Kapenguria and Lodwar................................ 1599
Heliotropium undulatifolium *Turrill.* Turkana Desert, between Kapenguria and Lodwar................................ 1606

TRICHODESMA.

Portuguese East Africa.

Trichodesma zeylanicaum *R. Br.* Thirty-five miles north-east of Macequece on road to Vila Gouveia...................... 477

Northern Rhodesia.

Trichodesma physaloides *A. DC.* Thirty-nine miles south of Broken Hill.. 1905

CYNOGLOSSUM.

Tanganyika.

Cynoglossum lanceolatum *Forsk.* Forty-seven miles north of Babati.. 871

VERBENACEAE.

LANTANA.

Kenya.

Lantana salvifolia *Jacq.* Between Fort Hall and Nyeri......... 1175

Belgian Congo.

Lantana salvifolia *Jacq.* Lake Kivu, near Sake................ 1787

VITEX.

Nyasaland.

Vitex sp. Prob. V. cuneata *Schum. & Thonn.* Thirty-two miles north of Limbe.. 569

Vitex cuneata *Schum.* and *Thonn.* (see Engl. Jahrb. 62 Beibl. III, V. cuneata = V. cienskowskii. Sixty miles north of Shirwa River on road to Dedza................................ 582

Vitex epidictyodes *Mildbr.* Thirty miles north of Rukuru....... 693

Tanganyika.

Vitex mombassae *Vatke.* Between Numbula and Ikwera....... 778

Vitex cuneata *Schum.* and *Thonn.* Eighteen miles north of Kondoa Iringa.. 837

Kenya.

Vitex cuneata *Schum. & Thonn* (poor specimen). Bukuna (?) Farm.. 1653

Belgian Congo.

Vitex madiensis *Oliv.* var. milanjiensis (*Britt.*) *Pieper.* Nineteen miles south of Kabongo................................ 1861

CLERODENDRON.

Tanganyika.

Clerodendron sp. On the Mbeya Range...................... 738

Clerodendron discolor (*Klotzsch.*) *Vatke.* Ngorongoro Crater..... 912

Clerodendron discolor (*Klotzsch.*) *Vatke.* Ngorongoro Crater..... 990

Kenya.

Clerodendron Zambesianum *Bkr.* Fifteen miles east of Kericho 1455

Belgian Congo.

Clerodendron sp. (not matched). Forty miles south of Kabongo 1865

Clerodendron Buchneri *Gürke* (?). Between Libode and Jadotville 1894

Rhodesia.

Clerodendron sp. Zambesi River........................... 1909

LABIATAE.

AJUGA.

Tanganyika.

Ajuga remota *Bth.* Herb, 12 in. high, Ngorongoro Crater....... 919

Kenya.

Ajuga remota *Bth.* In grassveld, Thompson's Falls............ 1305
Ajuga remota *Bth.* In grassveld, Thompson's Falls............ 1330

TINNEA.

Tanganyika.

Tinnea vesiculosa *Gurke.* North of Babati.................... 879

Kenya.

Tinnea aethiopica *Kotsch. & Peyr.* Slopes of Leningai Crater, Nakuru... 1408

SCUTELLARIA.

Nyasaland.

Scutellaria paucifolia *Bkr.* Fifty miles north of Katunga........ 704

NEPETA.

Tanganyika.

Nepeta azurea *R. Br.* ex descr. (?). Ngorongoro Crater.......... 908

Kenya.

Nepeta azurea *R. Br.* ex descr. (?). Plus minus eight miles north of Nanyuki... 1201

LEONOTIS.

Nyasaland.

Leonotis mollissima *Gürke.* Seventy-four miles north of Dwanga 634

LEUCAS.

Tanganyika.

Leucas sp. At Koratu, near Arusha......................... 1004

Kenya.

Leucas nakurensis *Gürke.* On hills Marmanite Forest.......... 1360

SALVIA.

Tanganyika.

Salvia nilotica *Vahl.* Slopes Ngorongoro Crater................ 961

MICROMERIA.

Tanganyika.

Micromeria biflora *Bth.* Ngorongoro Crater................... 936

AEOLANTHUS.

Nyasaland.

Aeolanthus sp. Probably A. Nyikensis *Bak.* On Zomba Plateau 566
Aeolanthus sp. cf. A. conglomeratus *Bak.*.................... 672

Tanganyika.

Aeolanthus sp. Eighteen miles north of Kondoa Iringa........ 849
Aeolanthus repens *Oliv.* (?) (Bracts with black tips). Fifty miles north of Babati.................................... 869

PYCNOSTACHYS.

Nyasaland.

Pycnostachys urticifolia *Hook.* Six miles east of Blantyre....... 539
Pycnostachys stuhlmannii *Gürke.* Fifteen miles north of Dwanga 622
Pycnostachys sp. Fifteen miles south of Mbulu on road to Arusha 883

PLECTRANTHUS.

Tanganyika.

Plectranthus sp. On Poroto Range......................... 763
Plectranthus sp. On Mount Kilimanjaro.................... 1042

COLEUS.

Nyasaland.

Coleus sp. cf. C. shirensis *Gürke.* Around Malange............ 549

Tanganyika.

Coleus sp. (not matched). Forty-seven miles north of Babati.... 873
Coleus sp. Affn. C. barbatus *Benth.* Ngorongoro Crater........ 895

Kenya.

Coleus sp. Seven miles north of Thika....................... 1164
Coleus sp. (but stamens united). Six miles north of Kapenguria 1514
Coleus sp. Between Kakamega and Busia.................... 1658

Belgian Congo.

Coleus sp. (?). Fifteen miles north of Sungu Mungu 1887

Rhodesia.

Coleus esculentus (*N. E. Br.*) *G. Tayl.* (= Plectranthus floribundus var. longipes *N. E. Br.*) Thirty-one miles south of Kafue... 1907

HOLOSTYLON.

Belgian Congo.

Holostylon sp. (?) (cfr. H. defoliatus *Hochst.*) Seventy miles south of Libudi.. 1893

IBOZA.

Nyasaland.

Iboza riparia (*Hochst.*) *N. E. Br.* Zomba Mountains.......... 594
Iboza riparia (*Hochst.*) *N. E. Br.* forma. Forty-nine miles north of Lilongwe.. 605

ACROCEPHALUS.

Portuguese East Africa.

Acrocephalus sp. Thirty-two miles north of Pengwe River on road to Vila Gouweia.................................. 490
Acrocephalus sp. (= No. 490.) Portuguese Nyasaland border.... 529

NYASALAND.

Acrocephalus callianthus *Brig.* (Figd. in " Fl. Plants of South Africa ", t. 847) (= *Greenway* 2530 and *J. C. Smuts* 2130). On Zomba Plateau.......... 567
Acrocephalus sp. Fifteen miles north Dwanga.......... 625

TANGANYIKA.

Acrocephalus sp. (= *J. C. Smuts* No. 2152). On the Poroto Range.......... 753

GENIOSPORUM.

NYASALAND.

Geniosporum paludosum *Bkr.* Fifteen miles north of Dwanga River.......... 621
Geniosporum paludosum *Bkr.* On Mbeya Range.......... 739

SOLANACEAE.

LYCIUM.

TANGANYIKA.

Lycium sp. (not matched). Ngorongoro Crater.......... 983

KENYA.

Solanum sapiaceum *Damm.* (= *Scheffler* 306). Between Londiana and Eldoret.......... 1468
Solanum sp. Globose fruit, 1 in. diam., large spines, small leaves, no number. Ngorongoro Crater.......... 936A
Solanum sp. (not matched).......... *No number*

SCROPHULARIACEAE.

RHAMPHICARPA.

TANGANYIKA.

Rhamphicarpa Heuglini *Hochst.* Eighteen miles north of Kondoa Iringa.......... 850
Rhamphicarpa sp. cf. R. asperrima (*Engl.*) *Skan.* Five miles north of Babati.......... 859
Rhamphicarpa sp. cf. R. asperrima (*Engl.*) *Skan.* Three feet high slopes Ngorongoro Crater.......... 982
Rhamphicarpa sp. cf. R. asperrima (*Engl.*) *Skan.* At Karatu 1005

KENYA.

Rhamphicarpa Jamesii *Skan.* Satik.......... 1437
Rhamphicarpa tenuisecta *Standley.* Five miles north of Timboroa 1469

UGANDA.

Rhamphicarpa Heuglini Hochst. (?). Thirty miles south of Fort Portal.......... 1683

CELSIA.

TANGANYIKA.

Celsia brevipedicellata *Engl.* Ngorongoro Crater.......... 933

KENYA.

Celsia brevipedicellata *Engl.* Thompson's Falls Camp........... 1329

VERBASCUM.

KENYA.

Verbascum ternacha *Hochst.* Thirty-seven miles north of Nanyuki 1203

HEBENSTREITIA.

TANGANYIKA.

Hebenstreitia dentata *L.* Ngorongoro Crater.................. 940

KENYA.

Hebenstreitia dentata *L.* Thompson's Falls................... 1364

SOPUBIA.

NYASALAND.

Sopubia ramosa *Hochst.* Dedza Camp......................... 592

TANGANYIKA.

Sopubia sp. Affn. S. ugandensis *S. Moore*, but calyx tomentose (not matched) Twenty miles north of Babati............. 861

PSEUDOSOPUBIA.

KENYA.

Pseudosopubia hildebrandtii *Engl.* ex. descr. Between Lokitaung and Lodwar... 1591

BUECHNERA.

TANGANYIKA.

Buechnera sp. cf. B. pulchra *Skan.* ex *S. Moore.* On Mbeya Range... 740

CYCNIUM.

TANGANYIKA.

Cycnium adonense *E. Mey.* (?) (but corolla tube shorter and broader at the apex). Eight miles north of Mbulu................. 887

STRIGA.

KENYA.

Striga hermontheca (*Del.*) *Bth.* Mealie lands, Kavirondo Flats.. 1645

BIGNONIACEAE.

TECOMARIA.

NYASALAND.

Tecomaria nyassae *K. Schum.* Hills three miles north of Ekwedeni 664

SPATHODEA.

UGANDA.

Spathodea nilotica *Seem.* Eturi Forest....................... 1739

STEREOSPERMUM.

BELGIAN CONGO.

Stereospermum kunthianum *Cham.* Between Kongolo and Katchi 1835

MARKHAMIA.

PORTUGUESE EAST AFRICA.

Markhamia obtusifolia (*Bak.*) *Sprague.* Twenty miles east of Macequece........ 468
Markhamia sp. Thirty-five miles north-east of Macequece...... 472
Markhamia sp. Twenty miles north of Vila Goubeia............ 492

TANGANYIKA.

Markhamia sp. (?). Near Mbeya.......................... 718
Markhamia obtusifolia (*Bkr.*) *Sprague.* Seventy miles north of Dodoma........ 824

BELGIAN CONGO.

Markhamia tomentosa *K. Schum.* Between Kotchi and Kabongo 1848
Markhamia sp. (?) stipules foliaceous.......................... *No number*

STEREOSPERMUM.

BELGIAN CONGO.

Stereospermum Kunthianum *Cham.* At Limbwe River......... 1835

PEDALIACEAE.

SESAMUM.

NYASALAND.

Sesamum angolense *Welw.* Near Dedza........................ 594

OROBANCHACEAE.

OROBANCHE.

NYASALAND.

Orobanche minor *Sutton.* Seventy-five miles north of Shiré River 584

GESNERIACEAE.

STREPTOCARPUS.

TANGANYIKA.

Streptocarpus glandulosissimus *Engl.* Mount Kilimanjaro...... 1040

LENTIBULARIACEAE.

UTRICULARIA.

NYASALAND.

Utricularia stellaris *L. f.* At Shiré River...................... 574

ACANTHACEAE.

BRILLANTAISIA.

BELGIAN CONGO.

Brillantaisia sp. cfr. B. kirungae. Luanda country near Goma 1796

MELLERA.

NYASALAND.

Mellera nyassana *S. Moore.* Forty miles north of Mzimba....... 678

ASTERACANTHA.

NYASALAND.

Asteracantha longifolia (*L.*) *Nees.* Zomba Plateau............. 62

TANGANYIKA.

Asteracantha longifolia (*L.*) *Nees.* North of Kondoa Iringa..... 835

THUNBERGIA.

TANGANYIKA.

Thunbergia alata *Boj.* (?) On Mbeya Range..................... 745
Thunbergia sp. Poroto Range.............................. 752

KENYA.

Thunbergia Gibsonii *S. Moore* (see Bot. Mag. t. 8604). Twenty miles south of Thompson's Falls, Aberdaire Range........... 1366
cf. Thunbergia alata *Boj.* Seven miles north of Kapenguria...... 1530

UGANDA.

Thunbergia erecta (*Bth.*) *T. Anders.* (Figured for Fl. Pl. S. Afr., t. 801). In Eturi Forest................................ 1725

BELGIAN CONGO.

Thunbergia sp. (Creeper). Forty miles south of Kabongo....... 1864
Thunbergia sp. (= No. 1864). Twenty-four miles south of Sungu Mungu... 1884

HYGROPHILA.

NYASALAND.

Hygrophila sp. (?) Fort Hill.............................. 706

DYSCHORISTE.

KENYA.

cfr. Dyschoriste radicans *Nees.* Ngong Hills.................. 1152

BARLERIA.

PORTUGUESE EAST AFRICA.

Barleria lateralis *Oberm.* Seventy-five miles north of Vila Gouveia, on road to Tete..................................... 501

KENYA.

Barleria sp. (near B. ventricosa ?). At Meru................... 1223
Barleria sp. Seventy-two miles north of Isiola................. 1251
Barleria sp. Turkana Desert, between Lodwar and Lokitaung... 1585

SCLEROCHITON.

UGANDA.

Sclerochiton sp. Shrub, 10 ft., in Eturi Forest................ 1735

BLEPHARIS.

NYASALAND.

cfr. Blepharis Buchneri *Lindau.* Four miles east of Mzimba along road.. 641

ACANTHUS.

KENYA.

Acanthus sp. cf. A. arboreus *Forsk.* Three miles south of Kakamega.. 1641

ASYSTASIA.

TANGANYIKA.

Asystasia Charmian *S. Moore* ex descr. (?) 3 ft. high, 15 miles north of Arusha to Moshi................................ 1030

HYPOESTES.

NYASALAND.

Hypoestes antennifera *S. Moore.* Flowers blue, plant 5 ft. About 30 miles north of Fort Hill................................ 715

TANGANYIKA.

Hypoestes verticillaris *R. Br.* (?) On plains in Ngorongoro Crater 966

KENYA.

Hypoestes verticillaris *R. Br.* Stony outcrop Machakos. Yatta Plains.. 1084

JUSTICIA.

TANGANYIKA.

Prob. Justicia sp. Seven miles north of Dodoma............... 812

Justicia sp. On edge of jungle, Ngorongoro Crater............. 918

KENYA.

Justicia sp. Bush, 12 in. Turkana Desert between Lokitaung and Lodwar.. 1597

MONECHMA.

Monechma debile (*Forsk.*) *Nees*.............................. *No number*

ANISOTES.

KENYA.

cfr. Anisotes sp. (?) Stamens 2. Plant 4 in. high. Hills between Lokitaung and Lodwar. Turkana Desert.................. 1592

RUBIACEAE.

OLDENLANDIA.

TANGANYIKA.

Oldenlandia sp. Plant, 3 in. high, flowers mauve. In tall grass Ngorongoro Crater....................................... 941

KENYA.

Oldenlandia sp. (?). Plant, 24–30 in. high, mountain range edge of Turkana Desert....................................... 1558

PENTAS.

TANGANYIKA.

Pentas sp. cf. P. longituba *K. Schum.* 3 ft. high, flowers white, eight miles north of Babati.............................. 860

Pentas longiflora *Oliv.* 3 ft. high, flowers white, inner slopes Ngorongoro.. 907

Pentas sp. cfr. P. Stolzii *K. Schum.* 30 in., flowers pale mauve, Mount Kilimanjaro.................................... 1041

KENYA.

Pentas sp. (?) Thompson's Falls............................ 1311A

Pentas sp. Kamasia Reserve................................ 1416A

Pentas sp. cf. P. carnea *Benth.* 30 in. high, five miles east of Kericho.. 1452

Pentas sp. affn. P. longituba *K. Sch.*, but leaves glabrous. 2 ft. high, flowers very long, tubular, white, 11 miles east of Kericho.. 1460

Pentas sp., near P. longiflora *Oliv.* 30 in. high (flowers much smaller than No. 1460). Eleven miles east of Kericho...... 1461

Pentas sp. (?) 4 ft. tall, in grass mountain slopes near Kapenguria 1639

BELGIAN CONGO.

Pentas sp. (?) 6 ft. tall, along Lake Kivu, near Sake............ 1806

OTOMERIA.

NYASALAND.

Otomeria dilatata *Hiern.* Fifty miles north of Katanga......... 702

BELGIAN CONGO.

Otomeria sp. cfr. O. guineensis *Bth.* Forty miles south of Kabongo.. 1870

HYMENODICTYON.

KENYA.

Hymenodictyon parvifolium *Oliv.* Shrub, 10 ft., Machakos Yatta Plains... 1086

BELGIAN CONGO.

Hymenodictyon sp. cfr. H. floribondum *Rob.* Shrub, 8 ft., red fruits, Lake Kivu, near Sake.............................. 1807

CROSSOPTERYX.

NYASALAND.

Crossopteryx febrifuga *Bth.* 15 ft. high, two miles north of the Shirwa River on road to Dedza........................... 578

MITRAGYNE.

BELGIAN CONGO.

Mitragyne sp. (?) Tree, 40 ft. At Luguiu River, Kotchi to Kabongo.. 1841

MUSSAENDA.

UGANDA.

Mussaenda tenuiflora *Benth.* (?) Shrub, 5 ft., yellow flowers, pinkish bracts, northern slopes of the Ruwenzori Mountains 1742

Belgian Congo.

Mussaenda sp. (?) (see *Milne Redhead* No. 1048). Fifteen miles south of Sungu Mungu 1888

RANDIA.

Nyasaland.

Randia Kuhniana *Hoffm.* and *K. Schum.* Tree, $\pm$ 15 ft., 18 miles north-east of Mzimba 646

Kenya.

Randia sp. (not matched). Tree, 15 ft. long, tubular flowers. Machakos Yatta Plains 1076

GARDENIA.

S. Rhodesia.

Gardenia asperula *Stapf.* and *Hutch.* Six miles east of Lundi Hotel 457

Nyasaland.

Gardenia imperialis *K. Schum.* Growing in forest at Malange 552

TRICALYSIA.

Nyasaland.

Tricalysia sp. (?) Tree, 15 ft., 10 miles north of Fort Hall 713

PENTANISIA.

Tanganyika.

Pentanisia ouranogyne *S. Moore.* Bluish flowers. Slopes of Ngorongoro Crater 996

VANGUERIA.

Tanganyika.

Vangueria sp. Fifteen miles north of Kondoa Iringa 838

Vangueria sp. Ten miles north of Mbulu 889

CANTHIUM.

Kenya.

Canthium sp., near C. schimperiana *A. Rich.* Between Kitale and Seringane Hills 1479

Portuguese East Africa.

Canthium sp. (?) " Wild Coffee ", Villa Gouveia 491

Tanganyika.

Canthium sp. .... *No number*

Canthium sp. cf. C. schimperianum. Slopes of Ngorongoro Crater 904

ANCYLANTHUS.

Belgian Congo.

Ancylanthus Bainesii *Hiern.* Forty miles south of Kabongo..... 1866

PAVETTA.

NYASALAND.

Pavetta crassipes *K. Schum.* Shrub, 8 ft., mountain range near Portuguese Nyasaland border........................... 530

TANGANYIKA.

Pavetta Schumanniana *F. Hoffm.* Between Nembula and Ikwera.. 783

Pavetta sp., about 18 miles north of Kondoa Irangi............. 846A

KENYA.

Pavetta sp. Escarpment Lake Harrington. Kamasia Reserve.. 1422

Pavetta sp. cfr. P. Oliveriana *Hiern.* Six miles north of Kapenguria.. 1512

Pavetta sp. or Grumilea sp. (?) Shrub, 4 ft., Machakos, Yatta Plains.. 1077

RUTIDEA.

TANGANYIKA.

Rutidea sp. (?) Creeper in Forest Kilimanjaro................ 1051

PSYCHOTRIA.

PORTUGUESE EAST AFRICA.

Psychotria sp. (?) Very poor specimen. Tree, 25 ft., 25 miles north of Vila Gouviea on road to Tete.................... 495

ANTHOSPERMUM.

TANGANYIKA.

Anthospermum sp. Mount Kilimanjaro....................... 1043

MORINDA.

BELGIAN CONGO.

Morinda confusa *Hutch.* Creeper with strange fruit. Between Katchi and Kabongo.................................. 1844

BORRERIA.

TANGANYIKA.

Borreria dibrachiata (*Oliv.*) *K. Sch.* 15 in. high, in cultivated lands 18 miles north of Kondoa Iringa......................... 848

RUBIACEAE INDET.

TANGANYIKA.

Shrub, 10 ft. Fruit suggest section Vangueriae. About nine miles north of Dodoma................................ 816

KENYA.

Leafy specimen only. Edge of Crater Marsabit................. 1255

Shrub, 8 ft. At Satik.. 1441

Shrub, 8 ft., 88 miles north of Kapenguria.................... 1543

UGANDA.

Tree, 20 ft., edge of forest on Ruwenzori...................... 1686

Belgian Congo.

Tree, 20 ft. Near Kabongo.............................. 1855
At. Katchi.. 1836

DIPSACACEAE.

SCABIOSA.

Tanganyika.

Scabiosa sp. cf. Scabiosa (Pterocephalus) frutescens *Hiern*. Open places in Ngorongoro Crater........................ 920

Kenya.

Scabiosa sp. Light blue flowers. Aberdaire Range............ 371
Scabiosa sp. Herb, 18 in. high, hill slopes three miles east of Nakuru.. 1407

CUCURBITACEAE.

MOMORDICA.

Tanganyika.

Momordica foetida *Sch. & Thonn.* (?) On Poroto Range........ 754

CAMPANULACEAE.

CANARINA.

Kenya.

Canarina abyssinica *Engl.* Four miles east of Lumbwa......... 1465

LOBELIA.

Tanganyika.

Lobelia sp. cfr. L. giberroa *Hemsley*. In forest Poroto Range 755

Kenya.

Lobelia Holstii *Engl.* Herb, 12 in. high, Thompson's Falls...... 1324
Lobelia aberdarica *R. E. Fr.* 4 ft. tall, Aberdaire Range........ 1372

COMPOSITAE.

GUTENBERGIA.

Tanganyika.

Gutenbergia polycephala *O.* and *H.* Flowers blue, plant 12 in. high, mountains 47 miles north of Babati................. 870

ERLANGEA.

Nyasaland.

Erlangea sp. Seventy-four miles north of Dwanga............. 636

Tanganyika.

Erlangea tomentosa *S. Moore*. On Poroto Range............... 764
Erlangea sp. (= *J. C. Smuts* 2139). Sao Highlands............ 797
Erlangea cordifolia *S. Moore*. Twenty-seven miles north Kondoa Iringa... 851
Erlangea cordifolia *S. Moore*. Seven miles north of Karatu...... 998

VERNONIA.

Portuguese East Africa.

Vernonia glabra *Vatke*, Macequece............................ 466
Vernonia Melleri *O. & H.* North of Livubwe River............. 527

NYASALAND.

Vernonia Bainesii *O. & H.* (?) Dedza Camp.................... 593
Vernonia podocoma *Schultz. Bip.* (?) Twenty-nine miles north of Lilongwe.. 604
Vernonia sp., near V. colorata. Foot Nyansi Hills on road to Mzimba.. 616
Vernonia Bellinghamii *S. Moore* (= V. goetzeana *O. Hoffm.*). Four miles north of Mzimba.............................. 640
Vernonia chloropappa *Bkr.* Thirty miles north of Katanga...... 698

TANGANYIKA.

Vernonia sp. Flowers mauve, plant 18 in. high. On Mbeya Range.. 736
Vernonia sp. Near V. filigera *O. & H.* ex descr. Fifteen miles north of Kandoa Iringa.............................. 833
Vernonia sp. Near V. adoensis *Sch. Bip.* Ngorongoro Crater... 906

KENYA.

Vernonia sp. (not matched). Six miles north of Nairobi......... 1153

MICROGLOSSA.

BELGIAN CONGO.

Microglossa volubilis *DC.* Lake Kivu, near Sake............... 1786

CONYZA.

KENYA.

Conyza sp. cf. C. Newei *O. & H.* Thompson's Falls........... 1314

TARCHONANTHUS.

TANGANYIKA.

Tarchonanthus camphoratus *L.* At Karatu..................... 999

KENYA.

Tarchonanthus camphoratus *L.* Near Nakuru................. 1380

PLUCHEA.

TANGANYIKA.

Pluchea dioscoridis *DC.* Ruaha River, on road to Dodoma..... 804

BLEPHARISPERMUM.

KENYA.

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Helichrysum Cooperi *Harv.* On Mbeya Range................ 732A

KENYA.

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TANGANYIKA.

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TANGANYIKA.

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BERKHEYA.

TANGANYIKA.

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Tree, 20 ft. Thirty-seven miles south-west of Busia............ 1663
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BELGIAN CONGO.

Shrub. On edge Lake Kivu, near Sake....................... 1776
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Tree, 50 ft. Markhamia (?). Thirteen miles south of Itula...... 1826

BOTANICAL SURVEY OF SOUTH AFRICA
MEMOIR No. 23

THE VEGETATION OF WEENEN COUNTY, NATAL

By

OLIVER WEST, D.Sc.

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DEPARTMENT OF AGRICULTURE
Division of Botany and Plant Pathology
BOTANICAL SURVEY MEMOIR No. 23.

THE VEGETATION OF WEENEN COUNTY, NATAL

(With map, charts and 38 illustrations, being part of the thesis submitted in fulfilment of the regulations governing the degree of Doctor of Science in the University of the Witwatersrand, Johannesburg)

By

OLIVER WEST, D.Sc.

Pasture Research Officer, formerly of the Division of Soil and Veld Conservation.

The Government Printer, Pretoria.

G.P.-S.10011—1949-50—750.

THE VEGETATION OF WEENEN COUNTY, NATAL.

TABLE OF CONTENTS.

FOREWORD.

It is my pleasure to present for publication this paper, entitled " The Vegetation of Weenen County, Natal ", prepared by Dr. O. West, formerly of the Division of Soil and Veld Conservation.

The area dealt with has suffered considerable depredation in the past due to faulty pasture management in both European and Native areas. In some parts the vegetation has been damaged, soil erosion has taken place to an alarming extent and the water resources of the fertile Tugela River Valley have been seriously depleted in consequence. In order to combat this general deterioration two pasture research stations were established, one at Estcourt and a subsidiary at Tabamhlope. Since then large scale veld, soil and water conservation projects have been inaugurated within the area.

As the vegetation is the key to the whole system of veld reclamation it is of great importance that there should be available as a basis for other research projects a comprehensive account of the vegetation and of the environmental conditions. Dr. West has produced a report which will be of invaluable assistance to Departmetal and other field officers working in the area. He has viewed the vegetation in its relationship to the whole environment and has shown the importance of taking into consideration the interdependence of the animal and the botanical aspects in such a biological study.

The check list of species will be a useful and convenient guide to the composition of the flora. It is fairly comprehensive and, even if not exhaustive, it is unlikely that any species of ecological importance has been omitted.

Apart from its immediate practical use the work is of considerable scientific interest and forms a valuable addition to the series of Botanical Survey Memoirs, of which it is No. 23.

R. A. DYER.

Chief, Division of Botany and Plant Pathology

and

Director of Botanical Survey of the Union of

South Africa.

Pretoria,

5th August, 1949.

INTRODUCTION.

This account of the Vegetation of Weenen County was begun towards the close of 1936, when I was posted to the Estcourt and Tabamhlope Stations as a Pasture Research Officer.

My work in Natal was interrupted due to the outbreak of war but I was enabled, through the consideration of my senior officers in the Division of Soil and Veld Conservation, to complete the writing of this thesis during a temporary release from the Union Defence Forces at the conclusion of the Abyssinian Campaign.

In the present version some results included in the thesis, dealing with the effects of cutting grassland at different heights and under different cultural and fertilising treatments, is omitted, and some changes have been made in the classification of the Plant Communities. The check list of the Flora has been considerably augmented by the addition of plants collected in the District by Mr. John Acocks, for whose co-operation and assistance I am very grateful.

I am glad of this opportunity of expressing my indebtedness to Professor John Phillips for the help and encouragement he has always given me and of acknowledging the long continued assistance I have received from Miss Lilian Britten, Doctors John Hewitt, J. S. Henkel and Professor A. W. Bayer.

For facilities and assistance I am grateful to Doctors I. B. Pole Evans, J. C. Ross, E. P. Phillips and to the staff of the Estcourt and Tabamhlope Research Stations, particularly to Messrs. J. D. Scott and J. A. Pentz.

I wish to thank Mr. Lambrechts, my assistant at Estcourt, as well as Mr. I. Hume and Mrs. C. Holm for their very valuable assistance in preparing the manuscript.

To the Chief and Staff of the Division of Botany and Plant Pathology and in particular to Doctors R. A. Dyer, and L. E. Codd, Miss I. C. Verdcorn, Mrs. Crook (Miss L. Chippindall) and Miss Forbes, I am greatly indebted for the naming of my collection of plants and for seeing the work through the press.

O. WEST,

Central Veld and Pasture Station,

Rhodes Matopos Estate,

Southern Rhodesia.

August 5, 1948.

CHAPTER I.

THE TOPOGRAPHY AND GEOLOGY OF WEENEN COUNTY.

(1) Topography.

(Diagram p. 42).

(i) *The Boundaries.*

The region known as Weenen County lies between 29° 00′ and 30° 30′ east longitude and north and south of the 29th parallel south latitude. It is roughly triangular in shape and possesses well defined natural boundaries, being bounded by the Drakensberg to the west and contained by the Tugela and Mooi Rivers from their sources in the Drakensberg to their confluence east of Weenen Village.

The Mooi River boundary is not adhered to entirely. The boundary follows the river from the confluence to a point on Doornkloof, a little north-east of Middlerest, where it leaves the river and proceeds in a southerly direction past Proudfoot's Peak to Oakspring about ten miles distant from the river. It then turns south-west and, following the river very closely, skirts Nottingham Road and Fort Nottingham, eventually rejoining the Mooi at the Krantzes. In 1894, when the counties of Natal were divided into smaller magisterial districts, the present districts of Estcourt and Weenen, as well as parts of Bergville and Msinga districts, were formed out of Weenen County.

The districts of Estcourt and Weenen with which this account is principally concerned are thus smaller than the area contained within the original boundaries of Weenen County, by (1) the Upper Tugela Location, now part of the Bergville district, which lies west of a line running northwards from the Drakensberg near Cathkin Peak to the Tugela, and by (2) Impafana Location, which forms part of the Msinga district, and is situated in the V formed by the Tugela and Mooi Rivers. It is bounded to the west by a line joining the Tugela to the Mooi, which runs south from the Tugela—Sunday's River confluence to Umhlumba Mountain and then turns south-east to join the Mooi east of Muden.

The districts of Weenen and Estcourt together cover an area of 2,332 sq. miles, Estcourt accounting for 1,872 of the total area. They are bordered to the west by Basutoland and the Bergville district, to the north and east by the Klip River and Msinga district and to the south-east and south by the Greytown, Lion's River and Impendhle districts.

(ii) *The Drakensberg.*

The region is dominated by the precipitous basalt krantzes of the Drakensberg from which the country falls away in a series of plateaux to the low-lying valleys of the Tugela and the Mooi. The Drakensberg, between the sources of the Mooi and the Tugela Rivers, attains most inspiring proportions, and when viewed from the Natal side presents an almost unbroken face of beetling precipices rarely

falling much below 10,000 ft. and piling up in places into the great masses known as Giant's Castle, Champagne Castle, Cathkin Peak and Mont-aux-Sources which attain altitudes of about 11,500 ft.

From Giant's Castle to Mont-aux-Sources the mountains run almost north-west. (Photographs 1–8.)

(iii) *The Rivers.*

On the summit of or just below the Berg arise the rivers which drain the county and because the major streams are all tributaries of the Tugela, which is itself the northern boundary, it is apparent that the land slopes towards the Tugela, that is, roughly to the north. The course of the Tugela, from its origin at Mont-aux-Sources to its junction with the Mooi, is a meandering one in a general west to east direction. Before reaching Bergville it is joined by the m'Weni and the Lambonjwa, and then in succession by the Little Tugela, the Blaauwkrantz, the Bushman's and the Mooi. These are the principal tributaries joining the Tugela from Weenen Country, and all flow in a north-easterly direction. The Bushman's and the Mooi are comparatively large. The Bushman's flows through the centre of the county roughly bisecting it, while the Mooi provides the southern boundary.

There are irrigation works on the Tugela, the Little Tugela, the Bushman's and the Mooi.

(iv) *The Plateaux and Escarpments.*

Below the precipitous Berg is a plateau which lies between 7,000 and 6,500 ft. and terminates in another precipitous escarpment formed by the Cave Sandstone and known as the Little Berg.

The Little Berg Plateau is part of the Drakensberg range and is nowhere very wide. It is cut up into segments by the streams which arise just below or on the summit of the Berg and carve deep gorges through the sandstone. These gorges converge and eventually unite to form the valleys of the Mooi, Bushman's and the Tugela Rivers, and their principal tributaries. (Photographs 9–16.)

The Tabamhlope Plateau lies below the Little Berg at elevations varying from about 5,000 to 4,500 ft. and is in turn ended by a steep escarpment which will be referred to as the *Draycott Escarpment*.

This plateau is widest between Estcourt and the Berg. The Oribi Flats, its north-eastern extension, follows the Mooi River and ends in a bold headland, Umhlumba (5,345 ft.) which towers out of the low-lying "Thornveld".

Tabamhlope (6,508 ft.), Niginya, Hlatikulu (6,554 ft.) and the Kamberg (6,906 ft.), spectacular cave sandstone-capped hills, arise from this plateau in a magnificent manner, lending much character to the landscape. They are detached outliers of the Little Berg Plateau, preserved by their capping of sandstone from reduction to the general level of the surrounding country. (Photographs 17–23.)

The Draycott Plain.—Below the Draycott escarpment there is an extensive peneplane or pan-plane which slopes to the Tugela. This level is characterised by small dolerite hills which give it a rolling appearance. In reality, however, it is a comparatively flat tract and for this reason is traversed by the railway and the National Road.

It ranges between 4,000 and 3,500 ft. in height, and along its northern margin falls very steeply into the valley of the Tugela. (The Draycott escarpment, photographs 24 and 25; Draycott Plain, photographs 26–33.)

(v) *The River Valley System or Thornveld.*

The Tugela and its tributaries, the Little Tugela, the Blaauwkrantz, the Bushman's and the Mooi have cut deeply into the Draycott Plain, producing a system of steep-sided, broad and flat bottomed river valleys which expand into a tract of low-lying country along the Tugela. This river valley country is bush covered and thus presents a very different appearance. It is known locally as the Thornveld. Much of it lies below 3,000 ft. (Photographs 34–38.)

(2) Geology.

Geologically the region is situated within the *Karoo System*, all the beds of which from the Middle Ecca to the Basaltic lavas of the Drakensberg are represented in a cross-section from the Mooi-Tugela confluence to the mountains.

(i) *The Ecca Series.*

The Middle and Upper beds of the Ecca Series are exposed in the eastern apex of the county.

(*a*) The *Middle Ecca* is characterised by thick bands of sandstone which, because of their hardness, build great spurs and masses such as Umsinga (5,000 ft.) just north of the Tugela. At Impafana these beds are said by A. L. du Toit (1939) to attain a thickness of 1,700 ft.

(*b*) The *Upper Ecca* beds consist of soft blue shales. An interesting feature in these beds is the occurrence of hard concretionary nodules rich in phosphate of lime. These nodules are common in the dongas below Weenen, where also phosphatised Dadoxylon wood has been found (Warren, 1912).

The Ecca Series is conformably overlain by the Beaufort Series, the lowest beds of which are exposed from about Weenen village.

(ii) *The Beaufort Series.*

(*a*) *The Lower Beaufort Beds* consist of felspathic sandstone, fine to medium grained, alternating with thick bodies of mudstone and shales. The shales and mudstones are quite hard when fresh, but break up into very small irregular fragments when exposed to the weather. It is astonishing to note how apparently sound, but exposed chunks of this rock disintegrate when disturbed. This characteristic greatly accelerates the rate of erosion and is largely responsible for the formation of the deep dongas so common in the areas occupied by these beds. The beds are intersected by innumerable sills and dykes of intruded dolerite. Calcareous nodules are sometimes plentiful and often litter the ground in places where the surface soil has been removed by erosion.

The Lower Beaufort Beds are exposed over much of the country lying between Weenen and the foot of the Draycott escarpment.

(*b*) *The Middle Beaufort Beds* are distinguished by the presence of bright-coloured, red, maroon and purple mudstones. They are about

500 ft. thick and form the Draycott Escarpment separating the Lower from the Upper Beaufort. The very thick band of sandstone which has been chosen as the uppermost horizon of these beds, forms the krantzes conspicuous near the summit of the Draycott Escarpment. Above it lie the Upper Beaufort Beds. (Photographs 22, 23 and 25.)

(*c*) *The Upper Beaufort Beds* like the rest of the series, consist of fine to medium grained felspathic sandstones, mudstones and shales. The mudstones, like those of the Middle Beaufort, are red and maroon. The shales are blue or green.

The Upper Beaufort forms the surface of the greater part of the Tabamhlope Plateau and is overlain by the beds of the Stormberg Series.

(iii) *The Stormberg Series.*

The Stormberg Series consists of—

(*a*) Molteno Beds,

(*b*) The Red Beds,

(*c*) The Cave Sandstone.

(*a*) *The Molteno Beds* are characterised by extremly coarse-grained, glittering sandstones, which form conspicuous ledges, terminating benches or terraces on the lower slopes of the Little Berg and its outliers such as the Tabamhlope Mountain.

The slopes below these ledges are usually littered with fallen boulders and blocks.

(*b*) *The Red Beds*, so-called from their prevailing colour, form very steep slopes separating the Molteno terraces from the perpendicular Cave Sandstone precipices. They are made up of layers of purple and red mudstones and shales and fine grained felspathic sandstones.

(*c*) *The Cave Sandstone* is a massive fine-grained rock which forms the spectacular capping precipices of the Little Berg and its outlier hills on the Tabamhlope Plateau.

On Tabamhlope Mountain the cave sandstone is 800 ft. deep. Geologists consider that this thick and extensive deposit was primarily aeolian in origin. (Du Toit, 1939, p. 270.) (Photographs 15 and 16.)

(iv) *The Drakensberg Volcanic Beds.*

The succession of lavas which comprise these beds are the youngest formation of the Karoo System and normally follow the Cave Sandstone evenly. At Mont-aux-Sources according to du Toit (1939), these beds have a vertical thickness of 4,500 ft.

They form the dark coloured precipices which cap the Drakensberg. Some impression of the grandeur of the scenery they give rise to is conveyed by the photographs 1–8

CHAPTER II.

HISTORY OF WEENEN COUNTY.

1. The Zulus.

The known history of Weenen County begins with the commencement of Zulu history.

At the close of the 18th century, Natal, as distinct from Zululand, was peopled solely by the so-called Lala tribes, who belonged to the Tekeza group, which included the Swazis and the Hlubis in the Eastern Transvaal. Southward in the Eastern Province of the Cape Colony were the Xosa group, "The kaffir Peoples", the Ngqika, the Gcalekas, the Bomvanas, the Tembus, the Mpondos, and so on.

Occupying what came to be known as Zululand were a group of clans allied to the Xosa group but cut off from their next of kin by the Lala tribes.

It may be that in their march down from more northern parts, the Zulu clans were left behind and later separated from their kinsmen the Xosa, by a wedge of Tekeza people reaching from the Transvaal through Natal to the sea, or perhaps these Zulu clans were driven out of the Eastern Province and returning settled amidst the Tekeza tribes. To the north east in Tongaland was a portion of the Tonga race, scattered fragments of which race are found as far north as the western shores of Lake Nyasa and in the neighbourhood of Rotseland on the Upper Zambesi. The central plateau formed by Basutoland, the Orange Free State and the Transvaal, Bechuanaland and parts of Rhodesia was occupied by various kindred tribes classed together as the Suto group. (Bryant, 1905; 25-66.)

The Lala people of Natal were divided into numerous small clans.

Included in the evidence of Sir Theophilus Shepstone in the report of the Native Commission 1883, on Native Laws, Customs etc., is a list of 94 tribes "which anciently occupied the territory now forming the Colony of Natal, prior to their being disturbed by Tschaka's wars, which began to affect them about 1812" (Moodie,1888).

As to the actual tribes which inhabited Weenen County it is difficult to make any definite statement. Bryant says: "The Wushus (now Bacas) were another large and much subdivided tribe, inhabiting all the country between Maritzburg and the Karkloof range. The emaKuzeni under Ngonyama, with their relations the enTlangwini were about the Bushman River where it joins the Tugela, and thence over and away towards Mzinyati . . . " (Bryant, 1905, p. 27). At Umsinga were the Bele clan, the Zizis along the Drakensberg at the sources of the Tugela and Nyamvus and Njilos about the Little Tugela (Byrant 1905, p. 39). In a paper read at a meeting of the Royal Colonial Institute, Sir Theophilus Shepstone says: "The country was thickly populated by numerous tribes under independent chiefs. These tribes lived so close together that tribal change of residence was difficult if not impossible. They intermarried

with each other—possessed flocks and herds—lived in ease and plenty themselves and at peace with their neighbours; until this luxury occasionally culminated in a periodical quarrel (as is the natural tendency, the natives say, in all that grows fat) and this quarrel was settled by a periodical fight". (Moodie, 1888, Vol. 11, p. 293).

This idyllic state of affairs was abruptly terminated about 1812 by the activities of Tschaka, successor to Dingiswayo. The events set in train by the aggressive acts of Dingiswayo were to be felt not only in Natal, but throughout southern Africa, and were to affect the entire scheme of things in the sub-continent.

The ripples caused did not die away as when a stone is cast into a pond, but increasing into great waves engulfed the land and its peoples in a sea of blood. Told in separate accounts by H. Finn and Sir Theophilus Shepstone, (Moodie, 1888, Vol. 11, pages 292–299 and 378–429), the events leading to Tschaka's rise to power will be sketched briefly:—

Ngodongwana, son of Jobe, chief of the Mtetwa clan in Zululand, became a fugitive and eventually returning after his father's death, killed his brother who was reigning, and possessed himself of the Chieftainship.

He returned with ideas strange to his people and immediately busied himself with the arts of peace and of war. Dingiswayo, as Ngodongwana now called himself, began a trade with the Portuguese at Delagoa Bay, at the same time organising his tribe into regiments according to their ages. His fighting machine functioning, he subjugated his neighbours and turned them into vassal tribes. About 1805, he offered harbourage to the boy Tschaka, son of Senzangakona, Chief of the Zulu clan, a subject clan.

Tschaka distinguished himself as a warrior in Dingiswayo's army and after the death of his father about 1810, assumed the Chieftainship of the Zulus still subject to Dingiswayo.

The volcano was shortly to erupt. Under the orders or with the approval of Dingiswayo, the Zulu clan under Tschaka attacked and defeated the Ngwana clan.

The defeated clansmen, under their Chief Matiwana, fled from their territory in the Vryheid district.

Driven out and homeless they were turned into a terrible gang of freebooters who, killing and taking as they marched, left destruction and desolation behind them and by causing whole tribes to flee before them, sent waves of destruction rolling over the Drakensberg.

They attacked and dislodged the Hlubi tribe (some of whom fled over the Drakensberg into the Orange Free State) and marching south through Newcastle and Klip River entered Weenen County somewhere near Umsinga, attacking and putting to flight the less powerful Lala clans along their route. Routing the Bele at Umsinga, they turned west and, following the Tugela, defeated the Zizis at its source. Wheeling, they swept along the Drakensberg, put the Nyamvus and Njilos to flight and settled in their territory until they were again driven out by Tschaka.

Then they fled over the Drakensberg among the Suto clans, defeated their old enemies the Hlubis again, and then dispersed the mountain tribes of Basutoland.

Tschaka struck again and drove them out of Basutoland and they continued their destructive march throughout Basutoland into Griqualand east and along the Drakensberg until they came to the sources of the Umtata River in 1828. The Umtata River was the last stream they were destined to cross for here they were destroyed by troops from Grahamstown under Major Dundas and Lt. Col. Somerset.

Meanwhile Tschaka had been steadily increasing his power, becoming, after the murder of Dingiswayo by Zivido, the most powerful chief in all Zululand. His rapidly growing armies ate up the country before them until every tribe from the Umzimvubu in the south to Delagoa Bay in the north, had been dispersed or brought into subjection. The Natal tribes, retreating, fled into the Eastern Province beyond the Kei and were there enslaved by the Gcalekas under the name of Amafengu.

Thus it was that when in 1823 Lt. Farewell and Mr. Finn arrived at Port Natal, they found the country an unpeopled wilderness.

2. The Voortrekkers.

The second act in the history of Weenen County opens with the advent of the Voortrekkers who crossed the Berg into Natal in November 1837, and established themselves temporarily in those parts which came to be known as Weenen County, while their leader, Pieter Retief, entered into negotiations with Dingaan across the Tugela. They found the country completely depopulated, but a great number of old stone kraals were mute witness to the former dense population destroyed by the tyrant Tschaka (photograph 36).

The tragic tale of the murder of the gallant Retief and his party by Dingaan at Umgungunhlovo and the massacre of some 600 of the emigrants encamped along the Bushmans and Blaauwkrantz Rivers is too well known to need re-telling.

It suffices to say that it led to the complete overthrow of Zulu power and to the establishment of the European farmer in Weenen County, a region once densely populated but swept clean and kept desolate for close on 20 years by the tyranny of Tschaka and his brother, murderer and successor, Dingaan.

After the defeat of Dingaan and his subsequent assassination, Mpande was formally crowned king of the Zulus by Pretorius on the 10th of February 1840. In the same year, Capt. Jarvis having been recalled from the Bay by Sir George Napier, the Boers proclaimed the Republic of Natalia. They established a capital at Pietermaritzburg, and divided the country into three districts, Pietermaritzburg, Weenen and Port Natal.

In each district the Government was administered by a Landdrost assisted by six Heemraden.

The British Government refused to recognise the independence of the New Republic. Capt. Smith, then in charge of the Umgazi post, was appointed Commandant at Port Natal, and on the 4th May 1842 camped

at the Bay. His camp was invested by the Boers and was eventually relieved by British forces under Lt. Col. Cloete. In August 1843, Natal became a British possession.

By Letters Patent dated 31st May 1884, Natal was made part of the Cape Colony and on the 13th November 1845, Mr. Martin West from Grahamstown was appointed Lieut. Governor.

Many of the Boers, determined not to return to British rule, left for the Transvaal thus making way for an influx of British settlers. The population increased rapidly and this led to the establishment in 1856 of a Legislative Assembly and the political severance of Natal from the Cape. Responsible Government, however, was not granted until 1893.

3. Establishment of the Counties.

The three districts, Pietermaritzburg, Weenen and Port Natal into which Natal had been divided by the Voortrekker Government, proved much too large for the successful administration of the province, so in 1847 proposals were made to divide Natal into six divisions to be known as Durban, Pietermaritzburg, Umvoti, Impafane, Upper Tugela and Umzinyate. In 1852 the Impafane Division, also known as the Mooi River Division, was called Weenen Division and suggestions as to the boundaries were made. By Government Notice No. 52 of 1853, the following counties were established: Durban, Lower Umvoti, Pietermaritzburg, Upper Umvoti, Impafane or Weenen, and Klip River. This arrangement stood until 1874 when the counties of Durban, Pietermaritzburg, Victoria, Umvoti, Klip River, Inanda and Tugela were established by a proclamation dated 23rd May 1874. Further sub-division was effected in 1894, when by Natal Proclamation No. 43 the present magisterial districts were established.

4. The Development of Weenen County and its Agricultural Industry.

(i) *The village of Weenen* was founded a century ago near the site of the Moordspruit massacre of 1838. There is an account by Johannes Kloppers of the founding of the village in a memorial dated January 1846, to Martin West, the Lt. Governor of Natal. In 1839 he obtained from the Voortrekker Volksraad the grant of a farm which he immediately occupied and ". . . some time afterwards the said Volksraad being desirous of commemorating the disastrous affair in the proximity of his farm in which 240 of the emigrants perished at the hands of the barbarous natives, proposed to erect a village on the said farm, and to name same Weenen."

The first farms in the then district of Weenen were inspected by the various fieldcornets in the year 1839 under the Voortrekker Government. It appears that as early as 1848 there was a dam and watercourse at Weenen for the vineyards and fruit trees of the inhabitants. This irrigation scheme must have been in operation for some time, because in that year the construction of a new watercourse was authorised. These early efforts in irrigation were persisted in and new furrows were made from time to time, until in 1902 a special new high level furrow was completed for the pupose of a Government Settlement. The Settlement was declared open for selection in 1903, and in 1909 there were 40 settlers. This irrigation scheme is on the Bushman's River and was formerly part of the commonage laid aside for the village of Weenen.

(ii) *Other Irrigation Works.*—Irrigation schemes must have been popular at this time because early in 1903 irrigation works were commenced on the Little Tugela for the Winterton Irrigation Settlement so-named in honour of the previous Minister of Agriculture who inaugurated it.

The fashion in irrigation was probably set by the Natal Native Trust who completed in 1897 an irrigation scheme on the Mooi River for the Impafane Location.

The Mooi River scheme was followed in 1903 by similar works on the Tugela River, which, however, proved unsatisfactory because of faulty design and construction.

(iii) *Village of Estcourt.*—Sir Harry Smith on his arrival in Natal, found great unrest among the farmers due to native disturbances and to restore order authorised the establishment of a military post at the Bushman's River. This was located on or near the farm Zaailager, and was to develop into the present township of Estcourt. In 1852 a Post Office was established at this post, and about this time too, the seat of the Magistracy was moved from Weenen to the military post. This change was a serious loss to the village of Weenen which had already suffered severely from the Boer exodus of 1848–49. In the early sixties the village which had grown up around the Military post and the Post Office was christened Estcourt, after Sothern Estcourt, a Member of Parliament for a constituency in Wiltshire, the English home of one of the earliest settlers by the drift on the Bushman's River. The following extract from a report written in 1885, illustrates the development of the village. "The Village of Estcourt, which I recollect twenty five years ago (1860) as consisting of two buildings, an hotel or roadside inn, and a small store, has progressed with rapid strides within the last three years owing to the prospects offered by the construction of a railway to connect it with Maritzburg and Durban. There are now upwards of 90 buildings . . . including 18 shops and six hotels." (Archives, Pietermaritzburg.)

The opening of the railway between Maritzburg and Ladysmith on the 21st June 1886 was an event of great importance as the improved communication gave great impetus to the development of the County.

(iv) *Fort Nottingham and the Village of Mooi River.*—Raiding parties of Bushmen from the Drakensberg were a source of great loss and annoyance in the early days of the settlement. Farmers and Natives alike called out for protection and at last after two particularly successful raids in February 1856, the Government was forced to take action.

Fort Nottingham was established and a detachment of the Cape Mounted Riflemen were stationed there. This post was located not far from the drift of the Mooi River which had been earmarked as a village site by the Land Commission in 1847.

Although a number of people were undoubtedly settled at the drift in the early forties, we know that the village was not laid out until after 1857, for in that year the Surveyor-General, in answer to a memorial of D. Grey praying for a grant of land at the Mooi River Drift, stated that "a survey of 6,000 acres has been made at the Drift of the Mooi

River for the purpose of a township. It includes both sides of the river . . . when the Township is laid off and erven are put up for sale, memorialists will have an opportunity to purchase. . . ." (Archives, Pietermaritzburg.)

(v) *Langalibalele Rebellion.*—The Government in 1849 settled Langalibalele on the source of the Blaauwkrantz River, and Munangalala on land along the Bushman's River above the farm Ogle. This location later became known as Drakensberg Location No. 1. The Tribe of Puteni were settled on the upper reaches of the Little Tugela, Drakensberg Location No. 2.

These locations were intended to close the mountain passes and guard the Colony against the inroads of the Bushmen, but the tribe of Langalibalele were destined to provide trouble rather than security. Settled in country which was uninhabited and with plenty of elbow room at its disposal, the tribe increased abundantly and amassed large flocks and herds.

When the diamond fields in Griqualand West were being developed many of the young men went to the diggings to work for guns which they brought back with them into Weenen County. When this came to the ears of the Magistrate at Estcourt, police were sent to bring in the men with their guns. The young men fled, and Langalibalele not only refused to look for them, but collecting a force of some 500 armed men, went into open rebellion and prepared to cross the mountains into Basutoland. He was intercepted at Bushman's Pass by a small party of the Natal Carbineers and some Basutos under Major Durnford on the 4th November 1873, and in the brush which followed the Carbineers "seized with panic" in the words of Major Durnford, "fled, followed by the Basutos" leaving three of their number and two loyal natives killed. Langalibalele escaped into Basutoland, where he was arrested by Mr. Griffith the representative of the Cape Government in that Country.

(vi) *The Boer War.*—The peace of Weenen County was not much disturbed by the Zulu War of 1879 or by the Boer War of 1880, but in the Second Boer War costly actions were fought at Colenso in December 1899 and at Spion Kop on the 20th January 1900. There were skirmishes too at Chieveley where Mr. Winston Churchill was taken prisoner, and at Willow Grange. The presence of large bodies of troops in the county undoubtedly quickened the tempo of development and brought considerable prosperity to the community.

CHAPTER III.

THE VEGETATION IN RELATION TO TOPOGRAPHY AND HISTORY.

1. Types of Vegetation.

Thode (1895) has observed that in Natal the botanical regions are largely delimited by altitude. In Weenen Country this observation is illustrated in a particularly striking manner.

The terraces which make up most of the area of the county are almost level, but are separated from one another by steep escarpments and, as would be expected, each terrace is characterised by very different climatic conditions and hence by great differences in vegetation. The sudden rises in altitude, separated by fairly wide terraces, have resulted in a unique telescoping of very different types of vegetation into a comparatively small area of country, where they lie sharply delimited and quite distinct.

As already explained, Weenen County is divisible into five distinct topographical regions:—

(1) The summit and steep slopes of the Dakensberg, 11,500 to 7,000 ft.

(2) The Little Berg Plateau which lies between 7,000 and 6,500 ft.

(3) The Tabamhlope Plateau lying between 5,000 and 4,500 ft.

(4) Draycott Plain lying between 4,000 and 3,500 ft.

(5) The River Valley System or Thornveld lying below 3,500 ft.

As one journeys across the county from the Tugela to the Berg, the *River Valley System* is first traversed. This is broken bush-covered country with steep stony hillsides and although it is known as the *Thornveld,* Acacia species play a very unimportant role in the bush which clothes the hillsides and other relatively undisturbed areas. They dominate however in the secondary scrub, which covers much of the valley bottoms where the ground is comparatively flat and has been cultivated.

As one ascends to the level of the Draycott Plain the bush gives way to a fringing zone of Acacia Open Woodland where the trees are widely spaced in grass. The trees end quite suddenly and are replaced by rolling grassland dotted in places with the large and stately nKamba trees (*Acacia woodii*) growing singly or in small groups (photograph 29). It is possible that years ago much of the Draycott Plain was covered by *Acacia woodii* Open Woodland. At present quite extensive stretches of this parklike woodland can be seen from the road linking Ennersdale, Moorleigh and Draycott (Photograph 30).

The indigenous Acacia species are almost entirely absent from the Tabamhlope Plateau, which is covered by grassland different both in appearance and in composition from that already traversed. Here Wattle

plantations are a feature of the landscape and patches of Evergreen Forest, Protea Open Woodland, Leucosidea and Buddleja thicket are very conspicuous on the *mesocline* of hills and on the slopes and in the kloofs of the Little Berg Escarpment.

The Little Berg Plateau is mostly covered by grassland similar to the grassland on the Tabamhlope Plateau. Evergreen Forest as well as the Protea and Leucosidea communities are important on steep slopes and in the kloofs, but the Protea and Forest give way when the level of the actual plateau is reached. Leucosidea persists and in places forms extensive communities along the streams, while *Widdringtonia dracomontana* in almost pure stands, fills the upper ends of the kloofs beyond the limits of the Evergreen Forest. The stately Tree Fern, *Cyathea dregei*, occurs in the open along streams here and on the escarpment (Photographs 1, 13 and 14).

The steep alpine slopes of the Drakensberg itself, arise quite suddenly from the limits of the Little Berg Plateau and on them the change in vegetation is most marked. There are steep buttress slopes of grassland which reach right to the foot of the precipices, while the valleys or folds between them are filled with shrubby vegetation resembling Macchia or " Fynbos " (Photographs 5 and 6).

The grassland and Macchia is particularly rich in Erica species and in the Compositae, particularly the genera Helichrysum and Senecio.

Much of the actual summit is rock or rock covered by a pebbly soil composed of small fragments of the underlying basalt (Photographs 3 and 4).

The vegetation here still represent early stages in the *Lithosere*, but the Alpine Grassland to which these stages give rise, covers extensive tracts reaching from the summit of the Drakensberg over the frontier hills of Basutoland, affording grazing for the ponies which roam right to the summit of the precipices.

This brief account shows the relationship between the vegetation and topography. Only the salient features have been stressed and no attempt has been made to go into details—that is in the subsequent chapters.

2. The Influence of Man.

In order to understand the present condition of the vegetation and to form some idea of the status of the different communities, it is necessary to consider the existing vegetation in the light of the history of the county. There are numerous features which are explained by a consideration of the effect of man on the vegetation.

It has been shown that except for the period of emptiness caused by Tschaka's wars, the area has always carried a large native population, who owned stock and practised cultivation. We are told by Shepstone that the country was thickly populated by numerous tribes who herded so close together that tribal change of residence was difficult if not impossible. Remains of the numerous stone kraals, a feature of the deserted country settled by the Voortrekkers, are still to be seen and evidence of long-ago, large scale disturbance of the vegetation by over-grazing, trampling and cultivation is plain.

European farming dates from the advent of the Voortrekkers and the earliest farms were located in the Thornveld and on the Draycott Plain. The Tabamhlope Plateau and the Mountain regions were inaccessible and were not farmed until much later. It soon became evident to farmers established in the country that the Draycott Plain afforded the most convenient locality in which to establish their homes.

The Tabamhlope Plateau was far removed from the main roads and the roads over the Draycott Escarpment were often impassable in summer. The winter grazing too, was very poor and this, combined with the poorness of the soils for crop production, made it impossible to winter stock there. In the Thornveld the climate was unpleasant, malaria prevalent and, as in the case of the Tabamhlope country, much of the area was inaccessible. The Tabamhlope Plateau however, provided farms very valuable for early summer grazing, while the excellent winter grazing in the Thornveld, together with the possiblity of establishing numerous kraals for Natives on these Thornveld farms so as to provide the necessary labour, made it desirable to own land both on the Tabamhlope Plateau and in the Thornveld in addition to the home farm on the Draycott Plain. This roughly is what came to pass. There are nevertheless many permanently occupied farms both on the Tabamhlope Plateau and in the Thornveld.

It is convenient to summarise now the major effects of man on the vegetation in each of the topographical regions.

(*a*) The slopes of the Drakensberg and the Little Berg Plateau have not been inhabited during the past few centuries by people other than Bushmen. To-day most of the country is in the care of the Union Forest Department, and beyond periodical burning is in no way disturbed by man, although formerly cattle used to be grazed on the Little Berg. On steep hillsides in the area a peculiar form of erosion is prevalent. Crescent shaped scars or "cat steps" caused apparently by the soil slipping on the underlying rock appear in lines across the hillside. Game and stock if present connect the ends of the crescents by paths and so aggravate the trouble (Photograph 9).

(*b*) The Tabamhlope Plateau carries a large Native population in three locations, as well as the European and Native occupants of privately owned farms. The soils are poor and, unless heavy dressings of fertilizer are applied, crops cannot be grown on the same site for any length of time. For this reason practically all the ground in the locations capable of being hoed or ploughed has been cultivated at some time or other, and on the farms the amount of abandoned cultivation is extremely large in proportion to the area under cultivation in any one year. Surface erosion, except for sheet erosion on bared cultivated fields is not conspicuous, but the peculiar form of subterranean erosion which results in the formation of underground tunnels is widespread and has been described by Henkel, Bayer and Coutts (1938). The sinkholes and gulleys formed by the subsidence of the roofs of the tunnels are dangerous to stock, but do not enlarge to any extent and are fairly rapidly reclaimed by grass.

(*c*) The Draycott Plain is probably, all things considered, the most fertile area in Weenen County. Cultivation is widespread and given sufficient rain the yields are good. The plain supports large herds and supplies much of the milk required by the Condensery in Estcourt.

Erosion in the form of steep-sided, ramifying gulleys is prevalent and is largely due to the farming system obtaining—too extensive cultivation combined with grazing. Much of the flat land is cultivated and because of this the stock are concentrated during the growing season on the stony hillsides, which are invariably over-grazed and so offer no check to the run-off caused by summer rain. When once the gulleys formed by this run-off water have sawn through the surface soils, they enlarge very rapidly because of the extreme erodibility of the underlying shales. In places such as the Native-owned farm under Draycott Hill, this form of erosion has laid waste large areas (Photographs 25 and 26). The dongas sometimes assume huge proportions and are frequently of considerable age, as is evidenced from the presence of the large nKamba trees found growing in their beds (Photographs 27 and 28). Fourcade (1893) mentions their presence as a feature of the area.

(*d*) In the Thornveld there are many farms used by their owners as reservoirs of Native labour. This pernicious practice has resulted in a great concentration of natives and their stock with the consequent laying waste of the area. The desperate condition to which this part of the country has been reduced must be seen to be realised.

As one travels along the road from Weenen to Muden or from Weenen to the junction of the Bushman's with the Tugela, miles of country can be seen where sheet and gulley erosion have gone so far that most of the top soil has long disappeared and is being rapidly followed by the underlying Ecca shales. Trees remain perched, stilt fashion, on their roots and whole hillsides riddled with dongas, are patently crumbling away (Photograph 38). From the summit of Umhlumba the prospect is melancholy in the extreme—bushveld riddled with cancerous scars stretches away to the Tugela, while occasional protected patches serve to remind one how fair it must once have been. J. A. Pentz (1940) gives the following figures for a portion of this area:—

	Acres.
Area completely eroded to rock or shales	21,699
Sheet eroded and overgrazed hillsides	37,465
Cultivated, badly eroded areas	15,251
Area in fair condition	38,762
Total area surveyed to date	113,177

Native ploughing in this area is a laborious and patient task. Long standing erosion has removed much of the soil from the surface of the fields, leaving them littered with boulders of all sizes and shapes. The single furrow plough is drawn by any power available, ranging from a team of four or six oxen to various mixtures of oxen, donkeys and, as has occasionally been observed, native women. When a stone is encountered the team comes to rest while the plough is lifted over it. In this way the furrow is driven over, rather than through, seemingly impossible obstructions. In other fields where erosion has proceeded so far that the stones cover the ground leaving no earth to plough, a different method of cultivation is followed. Here the stones are removed and built into walls which honeycomb the field, and the patches of soil thus bared are hoed and sown.

The native fields or gardens are not thoroughly cleared. *Boscia longipedicellata* is never removed and trees of many other kinds are often left standing. Eventually on such a field being abandoned, it rapidly loses

to the unexperienced eye all appearance of ever having been cultivated. Plough scratches on exposed stones and the type of vegetation, however, provide a clue to its previous history.

Observations in the area justify the presumption that cultivation has at some time or other been practised wherever the ground and angle of the slope will permit, and occasionally slopes of 1 in 2 are cultivated.

3. The Climax Associations.

It has been shown that the vegetation of Weenen County is made up of several distinct and easily recognised types. In order to understand the status and relationship of these types it is necessary to consider their development in the light of the known facts of plant succession.

Plant Succession is the process by which one and the same area is successively occupied by different communities of plants as the vegetation develops. The process is due to biotic reactions and is progressive, the successive stages eventually culminating in a final or climax stage which is determined by the climate. "The Climax" as Phillips (1935: 505) has stressed, "is in dynamic equilibrium not static adjustment with the habitat and often consists of a mosaic of types". Because the *Climax* is the final condition of the vegetation of a climatic region, it is the fundamental basis for the classification of the communities within that region (Clements 1928, 179; Phillips 1935, 242).

Weenen County shows several distinct climatic regions occupied in part by the corresponding climax vegetations, but over much of the area, it is apparent that the succession has been interrupted or deflected and is being held in check indefinitely, by recurrent fires, overgrazing and other causes. Vegetation thus held in an imperfect stage of development is here termed *sub-climax*. The grassland which forms such an important part of the vegetation of Weenen County is a sub-climax maintained principally by fire. If afforded protection it would develop toward forest or semi-deciduous bush depending on its situation.

The following classification of the most important plant communities indicates their status and serves as a foundation on which to build a description of the vegetation and its development.

The Major Plant Communities.

Climax Formations.	Sub-Climax.	Topographical and Climatic Region.
1. ALPINE....................	—	Summit and slopes of the Drakensberg down to 7,000 ft.
2. EVERGREEN (MOUNTAIN) FOREST	—	Little Berg and Tabamhlope Plateaux. Little Berg and Draycott Escarpments.
	3. Grassland	Little Berg and Tabamhlope Plateaux. The Draycott Plain. (*The Draycott Plain is an ecotonal region where the forest and semi-deciduous bush formations meet.*)
4. SEMI-DECIDUOUS BUSH	—	River Valley System.

CHAPTER IV.

THE ENVIRONMENT OF THE VEGETATION.

1. Soils.

According to the Soil Map of South Africa (v. d. Merwe, 1940) the following soil groups and sub-groups are represented in Weenen County:—

Summer Rainfall Area.

Arid and Semi-Arid Regions.

(1) Brown Low Veld Forest Soils.

Sub-Humid and Humid Regions.

(2) Brown to Reddish Brown Ferruginous Lateritic Soils.

(3) Gley-like Podsolic Soils, The High Veld Prairie Soils.

(4) Lateritic Red Earths and Lateritic Yellow Earths.

(5) Lithological Type, The Mountain Black Clays.

By far the greatest part of the country is covered by the Brown to Reddish Brown Ferruginous Lateritic Soils.

(1) *Brown Low Veld Forest Soils.*—The apex of the county from Weenen to the confluence of the Tugela and the Mooi is occupied by an outlier of the Low Veld soils which ". . occurs along the Tugela River in a pear-shaped area with its broader end at Weenen tapering eastward to beyond Krantzkop. This area is well sheltered by the high plateau on which Krantzkop and Greytown are situated. . . the vegetation and soils are definitely those of a semi-arid region. . . The soils, too, are very inferior, poorly developed, shallow, patchy and badly eroded. They consist of a light brown to a chocolate brown gravelly and stony loam to gravelly clay about 12 inches thick resting on rock fragments with which limestone concretions are mixed. Surface erosion is very bad." (Van der Merwe 1940, p. 107.)

Patches of what appear to be "Black Turf Soils" occur along the Tugela near Colenso, and elsewhere in the Thornveld. This is a heavy clay soil, which is adhesive when wet. It shrinks considerably on drying and develops characteristic cracks. It appears to be similar to the sub-tropical Black Clay soils of the Transvaal Bushveld, the occurence of which in Natal is not mentioned by van der Merwe.

(2) *Brown to Reddish Brown Ferruginous Lateritic Soils* occupy the Central and greater part of the county from Weenen to the foot of the Draycott Escarpment.

"The normal soils, developed under good surface drainage. . . consist of a greyish brown sandy loam to sandy clay loam, slightly dense, breaking into crumbs, abundant roots, humus moderately poor to fair, 6–10 inches thick, resting on a light brown crumby sandy clay loam, roots fair 8–12 inches thick. Underlying the above is a light brown, mottled

brown changing with depth to light brown mixed with reddish brown gravelly sandy clay loam, fairly dense, not cemented. The gravel consists of iron oxide concretions mixed with soil material, 12–18 inches thick. The foundation consists of a dark brown mottled reddish brown and yellow clay loam, compact breaking into clods when dry. This horizon contains few small iron oxide concretions and rests on partly decomposed shale and sandstone." (Van der Merwe, p. 252.)

Within this soil type on the Draycott Plain, the shales of the Lower Beaufort Beds are usually very near the surface and the sedentary soils derived from them are extremely shallow. In the valleys the soils are deep, but are usually *transitional* types and mixtures derived both from the intrusive rocks and from the older Karoo shales and sandstones. A typical profile in sedentary soil derived from overlying Beaufort shales under undisturbed veld, on the Estcourt Pasture Station shows a surface layer about 6 inches deep of grey brown soil with a granular structure. Below this there is a layer of light brown subsoil of variable depth from 3–18 inches, which gives way to a shallow massive layer of decomposed shale over solid shale. The proportion of Sand, Silt, and Clay determined by the Bouyoucos Hydrometer method are very variable. The following are from the profile described on the Estcourt Pasture Station.

Depth.	Sand.	Silt.	Clay.	Fine Clay.	M.W.R.C.	pH.
0—4″...........	34·6	26·0	39·4	36·0	47	6·2

M.W.R.C.—Maximum Water Retaining Capacity.

Van der Merwe states that " . . . in the Natal area the soils of lithogenic origin, developed from dolerite intrusions, are poorly developed and constitute the low hills or kopjes. These intrusions are covered by big spheroidal boulders underlain by various stages of soil formation, ranging from dark reddish brown crumbly clay with a fair amount of organic material, approximately 12 inches thick with boulders embedded in it, resting on yellowish brown partly decomposed rock, to a more advanced stage of development which has similar surface and substratum layers with a brownish red crumbly clay, 18–36 and more inches thick, sandwiched in between them. In this deeper phase spheroidal undecomposed dolerite boulders are often embedded in the soil mass. (Van der Merwe, p. 252.)

Dolerite intrusions are ubiquitous and accordingly soils derived from dolerite cover a large proportion of the area. A typical profile on high ground shows a surface 19 inches of dark brown soil with a marked granular structure. Below this there is a golden brown pebbly zone 6 inches in depth which gives way to a massive layer of yellow decomposed dolerite.

Depth.	Sand.	Silt.	Clay.	Fine Clay.	M.W.R.C.	Organic matter.	pH.
0–2″..........	27·2	30·8	42.0	38·0	53	13·07	5·8
0–6″..........	25·0	31·8	43·2	36·2	—	12·67	—
6–12″.........	24·0	30·6	45·4	41·7	—	11·85	6·1

These soils contain a large proportion of silt and clay and are agriculturally heavier and more fertile than soils derived from the shales. Under cultivation they assume a characteristic rich red colouration.

In the valleys the soils are much deeper but are usually very mixed and have been subjected to much interference by erosion and deposition. Samples taken from a valley near Estcourt, where the vegetation was fairly open Bush gave the following results:—

	Sand.	Silt.	Clay.	Fine Clay.	Organic Matter.	pH.
Surface Black Soil........	32·6	22·6	44·8	41·8	11·2	5·85
Surface Red Soil..........	24·8	16·0	59·2	57·8	8·6	7·10

(3) *Gley-like Podsolic Soils, The High Veld Prairie Soils.*—A belt of the Highveld Prairie Soils subdivision of the Gley-like Podsolic Soils lies along the foot of the Berg covering most of the Tabamhlope Plateau.

"The soils constituting this subgroup are mainly residual but on the slopes of the foot hills of the Basutoland Mountains with a steeper surface relief a certain amount of colluvial material might be expected to have been mixed with the residual soil. The soils are generally fairly deep with horizon well developed; the mature soils cover extensive areas." (Van der Merwe, p. 133.)

"The normal soils . . . consist of a dark greyish brown to greyish brown friable, sandy loam, poor in humus, overlaying a grey to light grey friable, sandy clay loam, with an occasional hard iron oxide concretion. Underlying the above is a yellowish brown, mottled brown gravelly clay, fairly dense with abundant ferruginous concretions embedded in the soil mass but uncemented, with a foundation of yellowish bluish grey, mottled light brown and brown, clay, compact, column like and impervious with scattered iron oxide concretions in the upper section of the horizon. Horizon C consists of a light grey, compact partly decomposed sandstone. Along the eastern border of this subgroup on the foothills of the mountains the soils are more sandy and the horizons thicker; also the colour of the substrate changes from the bluish tint to a brownish yellow. These soils developed under grass-steppe and subhumid climate are well leached of soluble salts and contain no calcium carbonate accumulation in the normal profile." (Van der Merwe, pp. 134–135.)

On the Tabamhlope Plateau the sedentary soils derived from the Upper Beaufort Beds are usually deep and present a fair degree of uniformity over a wide area. Under undisturbed veld the surface soil is brown and the surface 1–1½ inches contains quantities of vegetable mould, is very loose in texture and lacks any structure. Below this the soil is more compact and very faintly granular. At about 8 inches the colour changes to reddish buff. The granulation seems to persist to a depth of about 15 inches, but below this the subsoil has no definite structure. At about 4 ft. the colour of the soil deepens, and the massive layer is usually encountered between 7 and 8 feet. A long series of determinations by the Bouyoucos Hydrometer Method made over a considerable area at depths of 0–1 inch, and 1–6 inches showed a considerable range in the

proportions of sand, silt and clay in the surface soil. The following figures are from samples obtained from a typical profile on the Tabamhlope Pasture Research Station.

Depth.	Sand.	Silt.	Clay.	Fine Clay.	M.W.R.C.	Organic matter.	pH.
0—1″.........	57·4	16·1	26·5	—	—	—	—
0—6″.........	42·8	28·0	29·2	25·4	40%	7·8	5·2
15—18″.......	47·6	23·0	29·4	27·4	34%	4·4	4·9

The soils are agriculturally poor. When ploughed and cropped the dark brown colour of the surface soil, due to the accumulation of organic matter under grassland conditions, is soon lost and the cultivated lands assume a uniform reddish buff tint. The soils rapidly loose all trace of structure, become very powdery and are readily blown away, particularly when being worked.

(4) *Lateritic Red and Yellow Earths.*—Though these soil types are well developed under the Berg north of the Tugela and south of the Mooi, they are unimportant and cover very little area in Weenen County. Van der Merwe indicates small outlying patches within the borders of the county south of Bergville and north of Nottingham Road.

(5) *Lithological Mountain Black Clays.*—This soil group is confined to the Drakensberg itself and covers a narrow belt running along the mountain boundary from the Tugela to the Mooi.

" The soils . . . are of residual and colluvial origin derived entirely from the basalt rock. The passive soil forming factor—parent material—seems to predominate over the active soil forming factors and the soils should be classified as skeletal soils. . . sometimes the steep slopes are either covered with rock fragments mixed with little soil material or contain no soil at all." (Van der Merwe 1940, p. 119.)

2. Precipitation.

The area falls within the region of summer rainfall. Practically all of the rain falls between September and April. At Estcourt where rainfall records have been kept for more than 40 years, the mean annual precipitation is 28·84 inches in 81 days (Table I, p. 27). The curve of mean annual rainfall increases suddenly from 0·63 inches in August to 1·23 inches in September and 2·42 inches in October; then there is a gradual increase to the maximum in January, 5·37 inches. This is followed by a gradual decrease to 3·93 inches in March, with a sudden drop to 1·50 inches in April and 0·59 inches in May. The precipitation during the 4 winter months only totals 1·88 inches, or 6·5 per cent. of the annual precipitation. Most of the rainfall during the summer months occurs in the form of storms accompanied by thunder and lightning. Dry thunderstorms often occur during this season. The rain accompanying thunderstorms is usually very heavy. (See Tables IIA and IIB, pp. 28, 29).

In February 1941, 1·76 inches fell in one hour. During heavy rains the runoff is high because the soil is unable to absorb all of the rain as it falls. Bare ground is eroded very rapidly and the swollen rivers run heavy with soil carried to them. Practically all of the summer rains fall during the afternoon and at night. Rain between 08.00 hours and 12.00 hours is rare and not usually heavy.

During the winter months, thunderstorms are very infrequent and the intensity of precipitation when rain falls is low. (Rainfall during the dry months is important because resumption of growth is largely dependent on the amount of water in the soil. For this reason, rain during the latter half of August and in September is particularly desirable. If the first rains are delayed the dormant season is considerably prolonged. Supplies of conserved fodder run out and the live-stock suffer.)

Rainfall varies widely from year to year. The normal annual precipitation is 28·84 inches but the annual precipitation has ranged between 17·28 inches in 1935 to 42·12 inches in 1918. Periods of drought are liable to occur at any time throughout the growing season.

Hailstorms occur and often do great damage to standing crops but they are local and seldom affect large areas. Snow never falls at Estcourt.

The Draycott Plain.

Estcourt, already discussed, is typical of the area referred to as the Draycott Plain. Rainfall records have been kept at Estcourt since 1894. Draycott, Colenso and Bergville are located within the same general area. The normal annual rainfalls at these four stations is compared below. (See also Tables I and III, pp. 27, 30).

Estcourt: 28·84 inches in 81 days.

Draycott: 29·73 inches in 61 days.

Colenso: 32·43 inches in 80 days.

Bergville: 25·54 inches in 57 days.

The Thornveld.

Weenen village provides the most useful records from this area. Here the normal annual rainfall computed from records kept over a period of 36–40 years is 26·34 inches in 69 days. The mean monthly rainfall is practically the same at Estcourt. The steep broken nature of the country, however, encourages run-off and lessens the usefulness of the rain that falls. This condition is aggravated by the increasing area of eroded and denuded country caused by chronic misuse; hence the area is becoming increasingly arid.

The Tabamhlope Plateau.

There are no stations where records have been kept for any considerable period. But it is evident from the records of the Tabamhlope Pasture Research Station, which date back to August 1937, that precipitation here is much greater than on the Draycott Plain. The Mean Annual Rainfall is in the neighbourhood of 46 inches (Table IV, p. 31). At Fairview, Kamberg, the normal annual rainfall for a period of 15–17 years is 42·16 inches in 109 days. At Cathkin for a period of 3 years the normal is as high as 54·18 inches in 108 days, but Cathkin is an exceptional area and typical rather of the escarpment of the Little Berg than of the Tabamhlope Plateau. While the amount of rainfall at Tabamhlope is considerably higher than on the Draycott Plain, its nature and distribution are very similar. Snow sometimes falls high up on the hills but it is an unusual occurrence and never lies on the ground for any time.

The Little Berg Plateau and the Alpine Region.

For altitudes greater than those of the Tabamhlope Plateau there are no records, but it appears that precipitation increases rapidly with increasing altitude until the summit of the Berg is reached. During the summer, the Drakensberg is for the greater part of each day buried in cloud. In winter the first snow usually falls at the end of April or early in May, and during most winters snow storms are frequent enough to keep the highest parts snowclad until August.

3. Water Content of the Soil.

Rainfall affects the vegetation chiefly through increasing the water content of the soil. To study this relation, weekly water content determinations to a depth of 4 feet were made at Estcourt from 3.2.1938 to 29.5.1940.

A soil tube was used to cut cores and the samples taken in duplicate, consisted of the entire core of soil at depths of 0–6 inches, 6–12 inches, 1–2 feet, 2–3 feet, and 3–4 feet. Water content was calculated as a percentage of the dry weight of the soil. The total water content calculated on this basis is known as the *Holard* (Clements, 1905). The six inch samples weighed approximately 80 grammes and the 12 inch, 160 grammes. All samples were taken within an area of about 60 square yards, located in typical undisturbed grassland on the Estcourt Station. The graphs show the holard at each determination at the different depths. The wide range and rapid increase and decrease of the holard is very striking. (Table IVA, pp. 32 and 43–46).

During both years the absolute maxima and minima at all levels, except that of 6–12 inches, were obtained during the growing season, when the plants were making great demands on the available water. At all levels there is considerably less fluctuation during the winter months when the vegetation is dormant. It is interesting that in 1938 the fluctuation in holard decreased with increasing depth while in 1939 this tendency was not noticeable.

Correlation between Rainfall and Holard.

The graphs show a very close relation between rainfall and holard particularly in the 0–6 inch and 6–12 inch levels. Distribution and intensity of the precipitation and the evaporating power of the weather following rain, closely influence the relation between holard and rainfall and apparent discrepancies are mainly due to these causes. The relation between the phenology of the grassland and the holard will be discussed in a later chapter.

4. Air Temperature.

Official records are available from Cathkin Peak, Estcourt, Colenso and Weenen. The monthly mean and absolute maxima and minima recorded at these stations are tabulated (Tables V–VIII, pp. 33–36). Records kept at the Estcourt and Tabamhlope Stations since 1937 are summarised in Tables IX and X, pp. 37, 38.

The Average Day and Night Temperatures were secured by means of hydrothermographs housed in Stevenson Screens at a height of 4 feet above the ground. The averages were determined by the method used

by Weaver and Himmel (1931). *The Average Day Temperature* is the average of the temperatures recorded at 08.00, 10.00, 12.00, 14.00, 16·00 and 18·00 hours. *The Average Night Temperature* is the average of the temperatures recorded at 20·00, 22·00, 24·00, 02·00 04·00 and 06·00 hours. *Monthly Average Day and Night Temperatures* were obtained by averaging the average temperature for each day and night.

The Draycott Plain.

Estcourt, typical of this area, is discussed first. Monthly Average Day and Night Temperatures are presented for the period March 1937 to Dec. 1941. July is the coldest month. There is a steady rise in temperature from July to October, after which it may remain more or less stationary until the end of February—the hottest month may be any one of these four, November, December, January and February. The temperature falls from the end of February.

Monthly Average Day Temperatures are usually from 9—12 degrees higher than those for the night. Differences in the neighbourhood of 13° occur occasionally. The greatest difference occured in June 1941 when it was 14·3°.

There is no marked tendency for the differences to be greater or smaller in any particular season of the year, but wherever the difference is very small it has been during a summer month, e.g. 7·6° in December 1937, 4·8° in January 1939, 4·5° in February 1940 and 2·6° in March 1937. The maximum and minimum average monthly day and night temperatures during the period 1937–1941 were:—

Maximum Average Monthly Day Temperature: 77·8°, December, 1941.

Maximum Average Monthly Night Temperature: 66·3°, February, 1940.

Minimum Average Monthly Day Temperature: 53·9°, July, 1939.

Minimum Average Monthly Night Temperature: 43·0°, July, 1937.

The Absolute Maximum Temperature (in Stevenson Screen at 4 feet above ground) in each year may occur in October, November, December, January or in February. Since 1928 the temperature has not exceeded 100° F., and that temperature has been reached on three occasions only; during October 1931, January 1935 and November 1937.

The Absolute Minimum Temperature (in Stevenson Screen at 4 feet above ground) usually occurs in July, very occasionally in June. Since 1928 the lowest temperature recorded was 23° F., during July 1934; 23·50° was recorded in June 1941.

Grass Minimum Temperatures obtained by exposing a Minimum Thermometer during the night at ground level, are usually very much lower than those recorded in the screens at 4 feet above ground level. Frosts usually occur at ground level long before freezing temperatures are recorded in the screens. The lowest recorded temperature at this level during the period 1938–1941 inclusive is 18° F., which occurred during July 1940.

The first frosts usually occur in May or June and the last in September or October.

At Colenso, temperature recordings are available from 1933. Comparing these records with those obtained at Estcourt it will be seen that they are in the main very similar but that at Colenso the maximum temperatures are slightly higher.

The Thornveld.

The only records for this area are those from Weenen. They also are very like the records secured at Estcourt, except that the maximum temperatures are consistently higher.

Tabamhlope Plateau.

The only records available are maximum and minimum readings from thermometers in Stevenson Screens at 4 feet above ground at the Tabamhlope Pasture Research Station from 1938. These records are very incomplete. Both the maximum and minimum readings are consistently and considerably lower than at Estcourt. The highest recorded temperature is 98·5° F., during March 1938. During 1940 for which year complete records are available, 90° was reached twice only; in October and in December. The greatest monthly mean maximum was 78·48° for February; the lowest 60·66° for July. The lowest recorded temperature is 12° F., in June 1941.

Temperatures in the neighbourhood of 18° F., are quite usual during June, July and August. Here the winter is much longer and very much colder than at Estcourt. Frosts may occur from the middle of March to the end of October. It is a pity that no grass minimum temperatures are available from Tabamhlope. They would of course be much lower than the minimum temperatures recorded in screens at 4 feet.*

The records from Cathkin Peak (1934–1937) are interesting. Cathkin Peak is situated on the Little Berg Escarpment in an Evergreen Forest area. Due no doubt to the efficient drainage of cold air down the steep slope of the escarpment, the climate is very much milder than on the Tabamhlope Plateau proper. Severe frosts are not experienced. The lowest recorded temperature is 27·0° F., in July 1935. Slight frosts have been recorded in June, July, August and September. During occasional years as in 1936, no frosts at all are recorded at 4 feet in the screens. There are no records for altitudes above the Tabamhlope Plateau, but here the winters must be much more severe. Snowfalls are usual and the higher parts of the Berg are covered by snow for considerable periods.

5. Soil Depth Temperatures.

Measurements of Soil Depth Temperatures in undisturbed veld at the Estcourt Station have been made since July 1st 1939. Data are presented for the year 1940. Temperatures were measured at the following depths: $\frac{1}{4}$, 6, 12, 18 and 24 inches. A Cambridge Thermograph with the tube placed horizontally was used for the $\frac{1}{4}$ inch reading. Soil thermometers in metal tubes placed permanently in the ground and read three

* It is interesting to note that the absolute minimum frost temperatures at ground level are 6° F., for the Botanical Research Station at Frankenwald, near Johannesburg, in Trachypogon—Other spp. veld at 5,400 feet elevation, and 7° F. for Naudesfontein, near Bethal, in *Themeda triandra* veld

times a day at 08.30 hours, 12.00 hours and 17.00 hours, were used at the other depths. In placing the instruments care was taken to disturb the plant cover as little as possible.

The mean temperatures for the twelve months at the different depths are compared with the Average Day Air Temperature (08.00—18.00 *hours*), *recorded in a Stevenson screen at a height of* 4 *feet from the ground* (*Table XI*).

The annual range of temperature decreased with increasing depth. At $\frac{1}{4}$, 6, 12 and 18 inches the annual range was greater than the annual range in average day air temperature. Weaver and Himmel; (1931;36) in Nebraska, found the range greater than the normal air temperature to a depth of 6 inches. Table XI shows the progress of the *Annual Temperature Wave*.

TABLE XI.

MEAN SOIL TEMPERATURES IN DEGREES FAHRENHEIT AT DIFFERENT DEPTHS FOR THE TWELVE MONTHS, 1940.

Month.	Av. day air temp.	$\frac{1}{4}''$	6″	12″	18″	24″
January........	73·0	75·6	71·0	70·3	69·9	68·9
February.......	70·8	77·0	71·3	71·1	70·4	69·3
March.........	71·6	76·3	69·5	68·8	69·4	69·1
April...........	67·3	64·7	61·9	62·6	63·6	64·2
May...........	62·9	55·3	54·6	55·8	57·5	58·8
June............	57·2	51·0	50·0	51·4	53·4	54·8
July............	56·0	47·0	46·2	47·5	49·3	50·7
August.........	63·2	56·0	52·8	52·2	53·2	53·3
September......	66·8	62·3	57·8	57·8	57·6	56·8
October........	69·2	73·0	61·6	60·6	60·7	59·6
November......	71·0	75·0	66·9	65·4	64·8	63·4
December......	74·7	76·1	70·3	68·9	68·2	66·5
Max............	74·7	77·0	71·3	71·1	70·4	69·3
Min............	56·0	47·0	46·2	47·5	49·3	50·7
Range..........	18·7	30·0	25·1	23·6	21·1	18·6

During the months November, December, January and February, the mean temperature decreased regularly with increasing depth.

In March there was very little difference between the mean temperatures at 6, 12, 18 and 24 inches, while during April, May, June and July the temperature increased regularly with increasing depth from 6 inches to 24 inches. During August, September and October there were no marked differences between the mean temperatures at 6, 12, 18 and 24 inches. The temperatures at $\frac{1}{4}$ inch were always slightly higher than those at 6 inches. At all depths the minimum was reached in July and the maximum in February.

The mean temperature for the 12 months at 08.30, 12.00 and 17.00 hours are given in Table XII, p. 39.

The diurnal range decreases very rapidly with increasing depth. At $\frac{1}{4}$ inch the daily fluctuations were considerable and nearly coincident in time with the fluctuations in air temperature. At greater depths there

was a considerable time lag and this lag increased with increasing depth. At $\frac{1}{4}$ inch the maximum was recorded at noon, at 6 inches at 17.00 hours, and at two feet not until 08.03 hours on the following day.

6. Humidity.

Records of relative humidity at 08.30 hours are available from the meteorological stations at Weenen, Estcourt, Colenso and for a short period from Cathkin Peak, but unfortunately these records are of little value because at that time relative humidity is usually high and thus the 08·30 readings bear little relation to either the average or extreme conditions to which plants are exposed.

In the data presented (Table XIII, p. 41) from the Estcourt Research Station, the average relative humidity for the day and for the night, together with the average dry bulb temperatures are given from May 1939 to the end of 1941. The method used is that of Weaver and Himmel and has been explained (see Air Temperatures). It will be noticed that there is a considerable difference between day and night averages.

Berg winds, or hot, dry Foehn-like winds, are always accompanied by sudden drops in humidity.

To illustrate the weekly run of humidity two thermo-hygrograph charts are given. No. 1 illustrates a typical Berg wind week with hot, dry north winds accompanied by low relative humidity and high temperatures from Monday to Saturday, followed by a south wind, low temperatures and rain on Sunday. No. 2 illustrates a week in which a Berg wind on Monday was followed by cool weather and rain. In both charts the dry bulb temperature are set 10 degrees too high.

7. Wind.

Wind is important in increasing the evaporating power of the air and in promoting water loss directly from the plant. Bews (1912) and Phillips (1931) both stress the importance of Berg winds in this respect. Berg winds are from the north. They are hot and dry and exercise an extremely desiccating effect on the vegetation. These winds begin in August and are most frequent in December, January and in February. Usually they precede rain, and the cycle is as Bews (1912) points out, a spell of 2–3 days of hot dry winds from the north followed by cooler winds and rain. Sometimes the rain does not come and periods of drought aggravated by recurring spells of dry winds, set in. The Berg winds are usually gentle or moderate, seldom exceeding Force 4 Beaufort's Scale.

The strongest winds are from the west or south. These often approach Force 6 and may greatly exceed it. A particularly fierce gale began on 5th May 1940. At 08.30 hours it was raining and there was a slight breeze from the west. The wind increased in intensity during the morning and at 13.00 hours a south-east gale began to rage. The rain ceased at 16.00 hours but the gale continued and its force seldom fell below Force 10, until 03.00 hours, when it abated somewhat and changed to south-southwest. At 08.30 hours on May the 6th., 1940, a gale of Force 8 was still blowing, but at about 11.00 hours it had blown itself out and the wind dropped quite suddenly. Considerable damage to buildings and trees was caused throughout the area.

Thermo-hygrograph charts 1 and 2 illustrate the relation between wind and humidity (p. 47).

Thermo-hygrograph Charts.

(Bimetallic Wet and Dry Bulb Recording Hygrometer).

Chart No.1.—Estcourt Pasture Research Station, 9 October 1939. This chart illustrates a typical " Berg Wind " week with hot, dry, North winds accompanied by low relative humidity and high temperatures from Monday to Saturday, followed by a South Wind, low temperatures and rain (1·11 inches) on Sunday.

Chart No. 2.—Estcourt Pasture Research Station, 24 November, 1941 to 31 November, 1941. This chart illustrates a week in which a Berg Wind on Monday was followed by cool weather an drain (0·15 inches on Tuesday, 0·01 inches on Thursday, 0·27 inches on Friday, 0·52 inches on Saturday, 1·26 inches on Sunday).

In both charts the Dry Bulb reading are set 10° too high.

8. Evaporating Power of the Air.

During the growing season of 1939, standardised Livingstone, white, spherical, porous-cup atmometers were used to measure the *evaporating power of the air,* under different conditions of vegetation at Estcourt. The atmometers were used in couples at each locality and the reservoirs were sunk into the ground, so that the summits of the spheres were in all instances 6 inches above ground level.

The localities chosen were:—

1. Bare ground sparsely covered by *Cynodon dactylon.*
2. Typical undisturbed veld (grassland).
3. A small bush clump, consiting of three young *Acacia karroo* with undershrubs, in grassland.
4. A patch of dense bush in a ravine.

At localities 1 and 2 the atmometers were started on the 7th September 1939 and at localities 3 and 4 on the 2nd November 1939. They all ran until the 3rd May 1940. (Graph p. 48).

Locality.	Period.	Average Daily Evaporation.
1	35 weeks	21·86
2	35 weeks	10·26
3	27 weeks	10·26
4	27 weeks	5·24

It should be noticed that while the average daily evaporating power of the air was the same in undisturbed veld and in the Acacia bush clump to a height of 6 inches, the bush clump community is much taller, and within it the rate of water loss must be reduced to the height of the crown of the Acacia trees, that is to a much greater height above ground level than in undisturbed veld. The average daily evaporating power of the air in cubic centimetres by weeks for localities 1, 2 and 4 is plotted in Figure 1. The highest rates were reached in October and at the end of March, i.e. at the beginning and at the end of the growing season.

TABLE I.

RAINFALL NORMALS (INCHES) (*ref. p. 19.*)

	Fairview, Kamberg.	Cathkin.	Estcourt.	Draycott.	Bergville.	Colenso.	Weenen.
Altitude	5,400	4,192	3,803	3,700	3,700	3,151	2,773
Latitude	29° 20′	28° 58′	29° 00′	28° 59′	28° 44′	28° 43′	28° 51′
Longitude	29° 42′	29° 29′	29° 53′	29° 41′	29° 22′	29° 50′	30° 05′
Period in years	15–17	2–4	39–41	10–12	5–6	10–11	36–40
January	7·24	10·02	5·37	5·00	5·31	5·72	5·08
February	6·05	9·35	4·38	4·41	3·43	4·45	3·89
March	6·31	6·16	3·93	5·28	3·41	4·21	3·08
April	1·79	3·46	1·50	1·45	1·77	1·39	1·52
May	0·93	1·57	0·59	0·33	0·88	0·72	0·55
June	0·58	0·11	0·30	0·31	0·16	0·43	0·21
July	0·60	1·05	0·36	0·63	0·74	0·73	0·24
August	0·71	2·21	0·63	0·47	0·57	0·55	0·70
September	1·93	1·28	1·23	1·51	0·22	2·20	1·10
October	3·36	2·26	2·42	2·07	1·46	2·63	2·31
November	5·47	7·34	3·47	3·98	3·17	3·73	3·63
December	7·19	9·37	4·66	4·29	4·42	5·67	4·03
Total	42·16	54·18	28·84	29·73	25·54	32·43	26·34
No. of days	109	108	81	61	57	80	69

TABLE IIA.

ESTCOURT PASTURE RESEARCH STATION.

RAINFALL, 1940. (*ref. p. 19.*)

Month.	Rainfall.	Number of thunder-storms.	Number of days on which rain fell.	Time in hours.	Average Intensity (inches per hour).	Maximum Intensity.		
						Rainfall in inches.	Time in hours.	Intensity.
January	4·86	4	7	33·50	0·15	0·59	1·25	0·47
February	4·37	6	9	29·00	0·15	0·52	0·75	0·69
March	3·85	3	8	30·00	0·13	0·30	0·50	0·60
April	0·74	2	7	10·75	0·07	0·30	1·00	0·30
May	4·83	0	4	35·25	0·14	2·77	7·50	0·37
June	2·39	0	2	27·00	0·09	1·16	7·50	0·15
July	0·12	1	1	0·50	0·24	0·12	0·50	0·24
August	0·17	1	2	1·75	0·10	0·15	1·50	0·10
September	3·13	5	8	21·25	0·15	0·10	0·50	0·20
October	1·09	6	10	31·75	0·03	0·09	0·25	0·36
November	4·19	6	12	47·25	0·09	0·13	0·25	0·52
December	7·13	15	18	49·00	0·15	0·29	0·25	1·16
	36·87	49	88	317·00	0·12	—	—	—

TABLE IIB.

ESTCOURT PASTURE RESEARCH STATION.

RAINFALL, 1941. (*ref. p. 19.*)

Month.	Rainfall.	Number of thunder-storms.	Number of days on which rain fell.	Time in hours.	Average Intensity (inches per hour).	Maximum Intensity.		
						Rainfall in inches.	Time in hours.	Intensity.
January	4·56	10	14	43·25	0·11	0·25	1·25	0·20
February	11·98	13	17	37·25	0·32	1·76	1·00	1·76
March	9·72	7	10	34·00	0·29	3·40	3·00	1·13
April	4·18	5	7	51·00	0·08	2·25	11·00	0·20
May	—	—	—	—	—	—	—	—
June	—	—	—	—	—	—	—	—
July	0·28	—	3	4·00	0·07	0·16	2·00	0·08
August	—	—	—	—	—	—	—	—
September	0·47	2	4	8·50	0·06	0·15	1·00	0·15
October	3·09	9	9	31·25	0·09	0·95	0·25	3·80
November	2·86	6	10	21·75	0·13	1·26	2·00	0·63
December	4·10	16	11	24·25	0·17	0·43	0·75	0·56
	41·24	68	85	255·25	0·16	—	—	—

TABLE III.

ESTCOURT PASTURE RESEARCH STATION.

MONTHLY RAINFALL. (*ref. p. 20.*)

Month.	1937.		1938.		1939.		1940.		1941.	
	Rainfall.	No. of days.	Rainfall.	No. of days.	Rainfall.	No. of days.	Rainfall.	No. of days.	Rainfall.	No. of days.
January	—	—	7·52	13	2·66	14	4·86	7	4·56	14
February	—	—	6·12	14	9·41	12	4·37	9	11·98	17
March	0·85	5	1·81	3	5·04	12	3·85	8	9·72	10
April	0·34	4	5·31	9	1·03	5	0·74	7	4·18	7
May	—	—	0·08	1	2·17	3	4·83	4	—	—
June	0·01	1	1·66	4	—	—	2·39	2	—	—
July	—	—	2·51	4	0·95	2	0·12	1	0·28	3
August	—	—	1·07	4	0·37	2	0·17	2	—	—
September	0·42	3	1·08	6	2·23	7	3·13	8	0·47	4
October	1·16	7	4·78	10	2·76	11	1·09	10	3·09	9
November	3·43	9	2·37	9	7·91	12	4·19	12	2·86	10
December	7·16	15	4·04	14	4·26	12	7·13	18	4·10	11
TOTAL	—	—	38·35	91	38·79	92	36·87	88	41·24	85

TABLE IV.

TABAMHLOPE PASTURE RESEARCH STATION.

MONTHLY RAINFALL. (*ref. p. 20.*)

Month.	1937.		1938.		1939.		1940.		1941.	
	Rainfall.	No. of days.	Rainfall.	No. of days.	Rainfall.	No. of days.	Rainfall.	No. of days.	Rainfall.	No. of days.
January	*	*	8·82	16	6·79	20	6·30	15	6·83	11
February	*	*	3·49	9	14·06	20	3·94	14	13·98	16
March	*	*	2·04	11	3·86	16	7·65	15	6·89	11
April	*	*	5·42	9	0·74	6	2·46	12	3·34	6
May	*	*	0·27	2	2·08	5	4·46	3	—	—
June	*	*	1·18	4	—	—	2·44	2	—	—
July	*	*	0·34	2	1·57	4	—	—	0·95	3
August	0·08	3	1·75	5	0·88	5	1·42	3	—	—
September	0·60	7	1·36	5	2·50	7	1·55	8	0·58	3
October	2·96	13	6·69	18	4·74	14	3·00	7	4·50	12
November	2·88	14	4·17	11	7·49	19	5·06	11	2·88	6
December	10·74	15	8·85	23	5·61	16	6·96	15	4·71	10
TOTAL	—	—	44·38	115	50·32	132	45·24	105	44·66	78

* No records available.

TABLE IVA.

WATER CONTENT OF SOIL. (*ref. p. 21.*)

	0–6″	6–12″	12–24″	24–36″	36–48″
Range..............	15·0%–35%	16%–35%	14%–30%	7%–30%	6%–25%
Min. 1938..........	15·1% on 31/3	18·2% on 31/3	20·0% on 31/3	7·3% on 28/4	8·2% on 28/4
Min. 1939..........	14·9% on 12/1	15·9% on 6/1	14·1% on 12/1	8·5% on 12/1	6·1% on 12/1
Max. 1938..........	34·8% on 8/9	34·5% on 28/7	29·5% on 8/9	24·5% on 1/9	19·0% on 17/2
Max. 1939..........	34·9% on 16/2	34·5% on 18/5	30·1% on 9/11	29·7% on 9/11 and on 30/11	25·5% on 16/11 and on 14/12

TABLE V.

AIR TEMPERATURE AT ESTCOURT: IN STEVENSON SCREENS AT FOUR FEET ABOVE THE GROUND.—(*ref. pp. 21—23.*)

MEAN MAXIMA AND MINIMA IN DEGREES FAHRENHEIT.

Year.	January.		February.		March.		April.		May.		June.		July.		August.		September.		October.		November.		December.		MEAN.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1928...	82·7	60·2	83·8	58·7	81·8	57·3	77·3	50·2	71·8	41·3	68·8	32.4	67·6	31·9	69.8	38·9	76·6	—	76·9	—	83·5	—	83·9	59·6	—	—
1929...	82·6	60·5	81·8	58·8	76·7	55·6	76·0	49·0	73·3	44·4	65·6	37·9	64·7	35·6	68·5	38·5	71·6	50·2	75·6	54·1	79·7	56·6	82·4	58·0	74·9	49·9
1930...	80·3	58·9	81·6	58·1	78·4	55·4	74·7	47·9	71·2	38·0	64·0	33·1	66·7	33·8	69·5	36·1	73·4	45·6	79·9	52·0	81·4	56·2	86·7	59·6	75·7	47·9
1931...	80·8	60·4	86·9	61·5	82·7	57·0	74·4	49·5	75·8	43·5	65·7	34·8	62·1	36·3	74·3	39·6	77·1	43·8	78·6	57·0	80·3	57·6	84·9	59·1	77·0	50·0
1932...	82·4	58·3	77·9	60·6	76·1	57·3	78·6	51·7	69·5	42·7	66·1	36·7	66·0	34·6	72·5	41·2	76·7	49·8	78·6	53·9	77·8	56·0	79·0	59·4	75·1	50·2
1933...	84·1	59·6	82·6	59·4	82·4	58·2	75·8	51·4	72·9	44·3	65·1	32·7	64·8	38·9	69·1	42·5	76·1	47·4	80·3	51·8	74·9	56·2	77·0	57·3	75·4	50·0
1934...	77·6	60·0	78·9	58·0	78·0	57·7	75·0	53·3	71·3	45·2	65·8	38·8	63·5	36·6	70·1	43·6	74·5	44·4	78·0	51·9	76·9	57·7	77·3	58·6	73·9	50·5
1935...	82·9	59·4	76·1	56·6	74·7	55·2	72·4	49·7	67·3	40·7	62·9	33·7	66·4	35·4	64·1	37·3	75·5	45·4	81·1	53·8	80·4	52·8	81·2	56·4	73·8	48·0
1936...	80·8	59·1	78·7	58·7	77·6	56·9	74·7	52·0	66·6	41·0	66·6	35·7	66·0	36·7	71·5	40·3	73·7	45·8	73·0	51·2	74·0	53·6	81·7	58·1	73·7	49·1
1937...	79·8	60·6	80·1	60·4	79·4	55·8	75·1	49·1	—	—	69·5	34·5	65·8	32·9	72·3	40·8	74·5	44·8	76·3	52·9	84·9	57·0	77·8	57·5	—	—

ABSOLUTE MAXIMA AND MINIMA IN DEGREES FAHRENHEIT.

Year.	January.		February.		March.		April.		May.		June.		July.		August.		September.		October.		November.		December.		ABSOLUTE.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1928...	95	54	91	48	92	50	87	39	78	33	76	25	76	24	84	31	90	—	96	—	97	—	97	53	97	24
1929...	96	53	95	50	84	47	83	37	85	31	76	27	74	26	85	28	85	37	86	47	94	46	92	54	96	26
1930...	93	51	98	49	93	46	85	34	79	31	70	26	76	25	86	25	91	33	96	38	96	50	96	44	98	25
1931...	93	54	94	57	90	51	88	36	84	37	74	24	78	24	85	30	94	28	100	34	95	48	97	51	100	24
1932...	98	52	90	57	86	48	88	47	78	35	75	30	74	26	84	34	88	39	94	45	94	47	96	53	98	26
1933...	95	52	98	49	92	49	84	40	84	30	74	24	77	28	80	32	88	38	95	38	88	49	94	48	98	24
1934...	89	55	89	46	86	49	87	43	80	39	74	33	72	23	81	35	89	34	90	38	87	51	87	51	90	23
1935...	100	54	84	47	86	46	84	39	77	29	70	28	77	27	80	28	86	37	96	44	94	43	96	45	100	27
1936...	95	45	92	48	90	48	83	46	81	31	71	30	80	31	81	31	87	32	86	42	93	43	94	48	95	30
1937...	95	56	89	52	90	46	84	36	—	—	79	28	77	27	81	30	92	30	99	36	100	44	95	46	100	27

TABLE VI.

AIR TEMPERATURE AT COLENSO : IN STEVENSON SCREENS AT FOUR FEET ABOVE THE GROUND.—(*ref. pp. 21—23.*)

MEAN MAXIMA AND MINIMA IN DEGREES FAHRENHEIT.

Year.	January.		February.		March.		April.		May.		June.		July.		August.		September.		October.		November.		December.		MEAN.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1933...	87·4	64·8	85·7	62·1	83·1	60·3	79·1	51·8	72·8	44·0	67·3	31·2	68·1	41·4	73·8	43·4	79·6	49·1	84·4	56·6	78·5	58·7	80·9	60·6	78·4	52·0
1934...	81·6	62·3	82·6	59·9	80·7	59·8	79·3	52·9	73·4	44·7	66·9	34·8	65·5	33·8	76·1	41·3	81·6	44·4	83·1	50·2	82·3	59·0	80·3	56·4	77·8	50·0
1935...	86·5	60·5	80·2	57·3	78·4	56·2	77·2	51·3	69·4	38·8	64·0	28·3	72·7	32·3	74·4	33·1	80·0	46·3	89·4	53·8	88·3	53·6	91·2	55·5	79·3	47·3
1936...	88·5	55·6	—	57·0	83·5	55·2	—	50·4	75·9	37·5	73·3	31·7	—	33·2	—	39·1	—	47·5	—	47·4	80·2	—	—	—	—	—
1937...	89·0	50·4	88·0	53·0	93·2	51·4	83·0	41·7	83·6	36·3	77·7	27·9	77·9	25·1	78·0	40·8	84·6	46·6	87·5	49·3	91·5	58·3	81·8	58·9	84·7	45·0

ABSOLUTE MAXIMA AND MINIMA IN DEGREES FAHRENHEIT.

Year.	January.		February.		March.		April.		May.		June.		July.		August.		September.		October.		November.		December.		ABSOLUTE.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1933...	99	56	100	51	96	50	88	40	89	34	78	19	80	27	83	34	91	41	95	39	90	50	98	51	100	19
1934...	93	56	98	48	90	51	90	44	86	39	77	31	77	20	85	34	92	35	94	38	91	52	92	38	98	20
1935...	98	56	89	48	91	47	85	38	81	25	73	20	81	21	86	21	91	32	100	40	99	43	102	45	102	20
1936...	—	46	—	47	—	49	—	37	—	29	—	28	—	30	—	33	—	40	—	41	—	33	—	47	—	28
1937...	102	42	97	47	100	42	91	32	87	32	84	21	81	19	89	25	93	38	105	41	101	44	98	50	105	19

TABLE VII.

AIR TEMPERATURES AT WEENEN: IN STEVENSON SCREENS AT FOUR FEET ABOVE THE GROUND—(*ref. pp. 21—23.*)

MEAN MAXIMA AND MINIMA IN DEGREES FAHRENHEIT.

	January.		February.		March.		April.		May.		June.		July.		August.		September.		October.		November.		December.		MEAN.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1928...	86·3	62·9	86·8	61·1	87·2	59·3	80·8	52·4	76·9	39·5	73·6	31·0	72·6	32·4	75·0	39·0	80·9	45·3	81·1	55·1	86·1	58·7	89·3	61·9	—	—
1929...	87·2	63·2	87·2	60·8	81·8	57·2	—	—	77·7	44·3	68·9	39·5	69·3	36·2	72·8	40·4	76·0	53·3	81·4	56·4	87·2	60·2	88·8	61·7	—	—
1930...	87·3	61·8	88·2	60·5	—	—	—	—	—	—	—	—	—	—	73·6	36·6	77·5	47·6	83·9	54·0	85·6	58·7	89·6	60·5	—	—
1931...	85·1	—	91·2	47·6	85·8	—	79·4	—	79·8	41·5	70·1	33·0	67·2	35·7	79·1	40·8	82·1	43·4	83·5	52·3	84·9	60·0	90·9	65·3	81·6	—
1932...	88·6	60·2	84·4	63·3	80·8	59·1	83·2	52·6	74·4	44·1	70·7	33·8	71·6	30·2	78·5	37·6	81·7	49·6	86·9	54·2	82·9	57·8	86·5	62·3	80·9	50·4
1933...	89·9	61·8	88·4	61·6	88·1	59·5	81·2	52·6	78·9	42·2	69·8	31·5	72·0	37·2	77·0	43·5	82·5	47·1	86·5	50·6	81·5	58·2	84·5	58·7	81·7	50·4
1934...	—	—	—	—	82·9	60·3	80·2	53·6	79·0	44·8	69·8	37·6	68·6	35·0	75·7	44·5	80·3	44·8	83·5	54·2	82·3	60·5	82·1	61·2	—	—
1935...	90·0	62·4	81·4	58·5	80·2	57·5	77·6	51·1	72·3	41·3	68·3	30·2	72·1	33·8	69·0	35·2	79·9	44·9	85·7	54·5	85·5	53·9	86·1	—	79·0	—
1936...	86·6	53·1	83·7	60·6	82·1	58·2	80·3	52·0	70·2	41·4	70·1	32·3	71·2	33·5	77·9	38·9	79·5	45·4	77·2	53·6	77·4	56·3	87·9	61·4	78·7	48·9
1937...	86·5	63·7	86·5	63·8	85·8	58·3	79·7	49·2	78·0	39·5	71·4	32·3	69·7	32·6	77·0	41·5	79·1	46·2	80·4	55·5	89·2	59·5	81·0	60·2	80·4	50·2

ABSOLUTE MAXIMA AND MINIMA IN DEGREES FAHRENHEIT. | ABSOLUTE.

	January.		February.		March.		April.		May.		June.		July.		August.		September.		October.		November.		December.		ABSOLUTE.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1928...	100	56	96	53	97	52	92	45	81	32	81	27	80	29	86	30	95	34	100	41	100	44	103·5	54	103·5	27
1929...	100	55	100	51	91	50	—	—	87	32	77	28	79	29	89	30	89	40	94	49	100	52	99	55	—	—
1930...	100	57	105	52	—	—	—	—	—	—	—	—	—	—	90	29	97	32	100	40	100	53	99	45	—	—
1931...	98	—	100	41	96	—	94	—	87	34	79	25	78	26	89	31	99	31	104	40	99	50	104	59	104	25
1932...	105	52	93	57	92	51	92	47	82	38	76	29	78	26	88	32	93	41	100	41	99	50	104	58	105	26
1933...	100	55	102	49	99	50	96	40	89	30	80	24	84	24	85	36	94	39	102	35	95	51	102	49	102	24
1934...	97	—	96	—	91	51	93	40	86	38	79	32	77	23	88	34	96	35	97	40	94	53	92	54	97	23
1935...	102	56	93	48	94	51	89	41	84	29	86	26	84	27	85	23	93	35	103	43	100	41	100	—	103	23
1936...	101	44	95	52	97	49	89	47	86	31	77	28	84	29	87	33	94	34	93	44	99	50	100	49	101	28
1937...	100	57	98	56	95	49	89	36	90	31	79	25	79	26	89	30	97	32	103	38	101	47	98	48	103	25

TABLE VIII.

AIR TEMPERATURES AT CATHKIN PARK : IN STEVENSON SCREENS AT FOUR FEET ABOVE THE GROUND.—(*ref. pp. 21—23.*)

MEAN MAXIMA AND MINIMA IN DEGREES FAHRENHEIT.

Year.	January.		February.		March.		April.		May.		June.		July.		August		September.		October.		November.		December.		MEAN.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1934...	78·3	58·6	77·6	57·0	76·6	56·6	73·7	53·8	72·7	47·2	66·2	44·5	64·7	40·7	70·2	46·7	73·9	48·8	77·5	52·3	75·7	53·8	75·8	56·5	73·6	51·4
1935...	80·0	57·3	75·4	55·2	73·7	53·2	72·3	49·9	67·8	44·3	61·9	38·3	63·8	38·2	65·1	37·3	72·1	46·0	81·2	53·7	78·0	49·3	77·8	52·7	72·4	48·0
1936...	81·0	56·7	80·1	56·8	77·6	54·6	75·1	51·7	72·6	42·5	69·7	41·9	68·3	41·1	72·6	43·2	75·3	47·1	72·2	48·1	77·1	51·0	80·8	56·0	75·2	49·2
1937...	78·2	56·5	84·3	57·8	79·3	53·9	78·5	47·8	76·5	43·8	71·4	36·9	67·5	37·0	77·9	44·9	81·6	45·4	83·2	50·6	86·5	53·8	80·7	52·5	78·8	48·4

ABSOLUTE MAXIMA AND MINIMA IN DEGREES FAHRENHEIT. | ABSOLUTE.

Year.	January.		February.		March.		April.		May.		June.		July.		August		September.		October.		November.		December.		ABSOLUTE.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1934...	86	54	86	48	82	52	80	47	80	40	73	39	74	28	81	35	89	36	91	41	85	51	85	48	91	28
1935...	93	50	83	47	84	48	83	38	79	34	70	31	75	27	79	29	84	35	93	42	91	35	89	43	93	27
1936...	90	45	91	50	88	50	80	46	80	34	74	35	78	34	80	34	87	35	86	42	92	44	93	47	93	34
1937...	92	45	90	54	89	48	84	40	85	38	82	35	76	28	88	38	94	31	97	37	102	44	94	45	102	28

TABLE IX.

AIR TEMPERATURES AT THE ESTCOURT PASTURE RESEARCH STATION IN DEGREES FAHRENHEIT.—(*ref. pp. 21—23.*)

	Year.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Year. Abs. Max.	Abs. Min.	Av. Day.	Av. Night.	Av. Temp.
Mean Grass Min.	1937	—	—	—	—	—	—	—	—	—	48·94	53·14	54·69	98·25	27·00	64·43	54·18	59·30
Abs. Grass Min.		—	—	—	—	—	—	—	—	—	29·00	37·75	34·00					
Mean Max., in Stevenson Screens at 4 feet		—	—	77·74	75·00	73·5	67·66	64·51	71·16	73·40	76·51	84·91	76·80					
Mean Min. ,, ,, ,, ,,		—	—	54·02	48·50	42·74	36·10	34·59	41·36	44·68	52·16	55·59	56·31					
Abs. Max. ,, ,, ,, ,,		—	—	83·00	83·75	85·25	75·50	73·00	83·00	92·00	97·50	98·25	93·50					
Abs. Min. ,, ,, ,, ,,		—	—	45·50	39·00	35·25	28·25	27·00	31·00	29·50	34·50	43·00	45·50					
Ave. day ,, ,, ,, ,,		—	—	66·80	67·50	64·20	57·10	55·10	60·60	61·20	69·20	74·70	67·90					
Ave. night ,, ,, ,, ,,		—	—	64·20	56·60	51·50	45·20	43·00	49·80	51·70	57·90	61·60	60·30					
Mean Grass Min.	1938	56·27	55·89	55·87	44·15	42·29	33·96	33·71	34·60	40·10	47·15	—	—	96·50	29·00	66·68	56·94	61·81
Abs. Grass Min.		34·75	46·25	47·00	34·25	31·00	28·00	30·00	26·00	32·00	33·00	—	—					
Mean Max., in Stevenson Screens at 4 feet		82·30	78·57	81·18	74·45	70·98	65·58	64·61	67·56	74·98	77·61	79·23	80·45					
Mean Min. ,, ,, ,, ,,		58·39	56·21	56·09	52·80	43·58	37·74	38·80	40·43	44·30	51·89	53·36	57·27					
Abs. Max. ,, ,, ,, ,,		94·00	88·50	90·50	86·25	82·00	73·00	77·00	82·00	90·00	90·00	96·50	90·00					
Abs. Min. ,, ,, ,, ,,		50·00	48·75	52·50	41·25	32·25	31·00	33·00	29·00	32·00	43·00	41·00	50·00					
Ave. day ,, ,, ,, ,,		72·20	71·30	—	—	61·00	57·40	56·20	66·40	69·50	70·80	70·90	71·10					
Ave. night ,, ,, ,, ,,		64·20	62·60	—	—	50·00	46·80	46·10	55·00	60·30	60·60	60·10	63·70					
Mean Grass Min.	1939	—	—	—	—	—	—	—	—	—	—	—	—	93·00	27·00	65·08	56·21	60·64
Abs. Grass Min.		—	—	—	—	—	—	—	—	—	—	—	—					
Mean Max., in Stevenson Screens at 4 feet		79·81	77·95	74·44	71·69	66·35	65·72	61·36	67·35	71·11	78·32	71·58	78·29					
Mean Min. ,, ,, ,, ,,		57·10	60·44	54·92	47·88	43·30	38·08	37·38	40·60	43·75	52·60	53·16	57·70					
Abs. Max. ,, ,, ,, ,,		92·00	89·00	85·00	85·50	78·50	78·00	72·00	78·00	85·00	92·00	90·00	93·00					
Abs. Min. ,, ,, ,, ,,		50·00	54·25	49·00	32·50	36·00	31·00	27·00	31·50	36·00	46·00	41·00	52·00					
Ave. day ,, ,, ,, ,,		69·90	72·60	68·60	66·10	64·00	54·80	53·90	59·60	61·80	69·80	67·50	70·40					
Ave. night ,, ,, ,, ,,		65·10	65·70	60·60	56·10	52·60	45·60	45·60	49·60	52·30	60·70	58·70	61·90					
Mean Grass Min.	1940	—	—	—	46·73	36·45	32·18	26·77	36·29	44·17	43·65	51·80	56·48	94·00	26·50	66·97	56·66	61·81
Abs. Grass Min.		—	—	—	35·00	28·00	18·50	18·00	27·00	29·00	28·00	33·50	47·00					
Mean Max., in Stevenson Screens at 4 feet		81·10	84·21	79·03	75·23	70·73	65·22	66·24	71·60	74·32	77·00	77·93	81·44					
Mean Min. ,, ,, ,, ,,		58·15	59·45	57·98	49·52	44·28	39·83	36·35	43·84	49·32	50·60	55·98	59·10					
Abs. Max. ,, ,, ,, ,,		92·00	92·00	89·50	83·00	80·00	76·00	78·50	83·00	86·50	93·00	93·00	94·00					
Abs. Min. ,, ,, ,, ,,		50·00	54·00	49·00	39·50	36·50	27·00	26·50	37·00	40·50	37·00	42·00	52·00					
Ave. day ,, ,, ,, ,,		73·00	70·80	71·60	67·30	62·90	57·20	56·00	63·20	66·80	69·20	71·00	74·70					
Ave. night ,, ,, ,, ,,		63·60	66·30	62·80	55·60	51·30	46·00	44·20	50·90	56·00	56·50	62·00	65·00					
Mean Grass Min.	1941	56·45	56·96	51·73	47·77	38·33	28·24	28·97	33·50	39·08	49·30	49·30	55·40	97·25	23·50	68·73	56·98	62·85
Abs. Grass Min.		51·50	50·00	37·00	34·00	22·50	20·00	20·00	22·00	24·50	34·50	35·00	39·00					
Mean Max., in Stevenson Screens at 4 feet		79·97	78·93	77·44	76·50	73·69	67·63	67·13	71·89	74·70	80·19	81·63	85·40					
Mean Min. ,, ,, ,, ,,		59·21	59·61	55·10	51·98	45·26	36·93	37·47	41·31	46·38	53·51	53·86	58·80					
Abs. Max. ,, ,, ,, ,,		90·50	85·50	89·00	85·00	81·00	80·50	77·50	84·75	89·00	93·75	97·25	95·50					
Abs. Min. ,, ,, ,, ,,		55·00	54·00	42·00	39·00	31·50	23·50	32·00	31·00	29·75	40·00	41·50	45·50					
Ave. day ,, ,, ,, ,,		73·80	72·60	71·30	69·10	65·80	58·80	58·70	62·60	67·80	72·70	73·80	77·80					
Ave. night ,, ,, ,, ,,		65·00	64·20	61·50	58·10	52·70	44·50	45·90	49·60	55·30	60·10	60·90	66·00					

TABLE X.

AIR TEMPERATURES AT THE TABAMHLOPE PASTURE RESEARCH STATION IN DEGREES FAHRENHEIT.—(*ref. pp. 21—23.*)

THERMOMETERS IN STEVENSON SCREENS AT FOUR FEET ABOVE THE GROUND.

	Year.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Absolute Maximum.	Absolute Minimum.
Mean Max.	1940	75·87	78·48	74·06	70·21	65·00	60·93	60·66	67·10	71·02	68·53	73·60	77·61	90·00	16·50
Mean Min.		53·23	53·81	53·77	45·91	34·18	30·83	24·00	32·92	46·22	47·50	51·25	51·81		
Abs. Max.		87·00	88·00	82·50	77·00	77·00	73·00	74·00	78·00	81·00	90·00	87·00	90·00		
Abs. Min.		46·50	42·50	45·50	32·00	20·00	21·00	16·50	25·00	27·00	30·00	41·00	35·00		
Mean Max.	1941	74·00	71·10	76·43	71·10	71·21	63·00	62·42	67·39	70·98	74·34	75·82	80·62	92·00	12·00
Mean Min.		53·58	51·50	51·53	46·03	41·25	26·31	25·61	29·33	38·22	48·56	48·37	54·07		
Abs. Max.		84·00	81·00	86·00	80·00	79·00	75·00	73·00	79·00	81·00	85·50	90·00	92·00		
Abs. Min.		46·00	42·00	42·00	31·00	25·00	12·00	13·00	16·00	21·00	31·00	35·00	39·00		

TABLE XII.

MEAN SOIL TEMPERATURES IN DEGREES FAHRENHEIT AT DIFFERENT DEPTHS AT 08·30, 12·00 and 17·00 HOURS AT ESTCOURT DURING 1940.—(*ref. p. 24.*)

Depth.	January.			February.			March.			April.			May.			June.		
	08.30 hours.	12.00 hours.	17.00 hours.	08.30 hours.	12.00 hours.	17.00 hours.	08.30 hours.	12.00 hours.	17.00 hours.	08.30 hours.	12.00 hours.	17.00 hours.	08.30 hours.	12.00 hours.	17.00 hours.	08.30 hours.	12.00 hours.	17.00 hours.
¼″..................	69·0	81·4	76·4	69·0	82·0	80·0	68·0	82·0	79·0	62·0	68·0	64·0	52·0	59·0	55·0	45·0	52·0	56·0
6″..................	69·2	71·4	72·5	69·4	71·6	72·9	68·1	69·5	70·9	60·0	62·2	63·6	53·4	54·6	55·8	48·9	50·1	51·2
12″..................	70·1	70·3	70·6	70·7	71·0	71·5	68·6	68·9	68·9	62·4	62·5	63·0	55·5	55·6	56·4	51·3	51·5	51·5
18″..................	69·9	69·9	70·0	70·3	70·4	70·5	69·3	69·4	69·4	63·5	63·6	63·6	57·8	57·8	58·0	53·4	53·5	53·4
24″..................	68·9	69·0	69·0	69·3	69·3	69·3	69·0	69·1	69·1	64·2	64·2	64·1	58·7	58·6	59·2	54·7	54·8	54·8

Depth.	July.			August.			September.			October.			November.			December.		
¼″..................	43·0	51·0	47·0	52·0	59·0	57·0	61·0	69·0	64·0	64·0	83·0	72·0	68·0	82·0	75·0	71·5	81·6	75·2
6″..................	44·6	46·2	47·9	51·2	52·8	54·6	56·8	58·4	60·2	60·1	61·4	63·5	64·9	66·9	69·0	68·4	70·0	72·6
12″..................	47·4	47·5	47·7	51·1	52·7	53·0	57·6	57·7	58·1	60·9	60·9	60·1	65·1	65·3	65·7	68·4	68·5	69·9
18″..................	49·3	49·3	49·3	53·2	53·2	53·3	57·5	57·6	57·7	60·9	60·7	60·7	64·8	64·8	64·9	68·2	68·2	68·3
24″..................	50·7	50·7	50·7	53·3	53·2	53·3	56·8	56·7	56·8	59·8	59·6	59·6	63·4	63·4	63·5	66·7	66·6	66·2

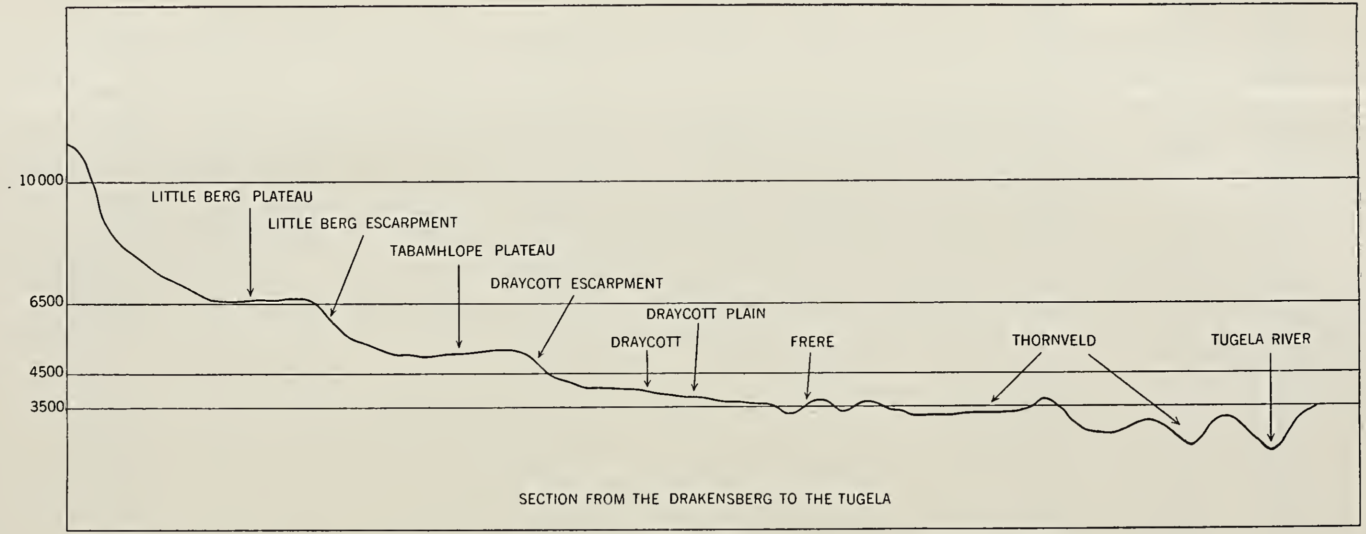
TABLE XIII.

AVERAGE DAY AND NIGHT DRY BULB TEMPERATURES AND RELATIVE HUMIDITIES AT ESTCOURT.

HYGROTHERMOGRAPHS IN STEVENSON SCREENS AT FOUR FEET ABOVE THE GROUND.

	1939.		1940.		1941.	
	Average dry bulb temp.	Average relative humidity.	Average dry bulb temp.	Average relative humidity.	Average dry bulb temp.	Average relative humidity.
January—						
Day.........	*	*	73·0	61·5	73·8	64·0
Night........	*	*	63·6	80·0	65·0	85·5
February—						
Day.........	*	*	75·7	56·0	72·6	70·5
Night........	*	*	66·3	69·0	64·2	87·0
March—						
Day.........	*	*	71·6	62·0	71·3	63·5
Night........	*	*	62·8	77·0	61·5	85·0
April—						
Day.........	*	*	67·3	54·5	69·1	62·5
Night........	*	*	55·6	78·0	58·1	84·0
May—						
Day.........	64·0	52·7	62·9	48·5	65·8	54·0
Night........	52·6	65·5	51·3	73·5	52·7	85·0
June—						
Day.........	56·8	49·6	57·2	53·5	58·8	49·0
Night........	45·6	76·5	46·0	79·0	44·5	75·6
July—						
Day.........	53·9	47·7	56·0	47·0	58·7	50·0
Night........	45·6	80·0	44·2	67·0	45·9	68·0
August—						
Day.........	59·6	51·1	63·2	49·0	62·6	46·5
Night........	49·6	70·5	50·9	70·5	49·6	74·0
September—						
Day.........	61·8	52·3	66·8	53·5	67·8	36·5
Night........	52·3	71·5	56·0	86·0	55·3	64·5
October—						
Day.........	69·8	59·7	69·2	49·5	72·7	45·0
Night........	60·7	73·5	56·5	79·0	60·1	73·5
November—						
Day.........	67·5	59·8	71·0	57·5	73·8	46·0
Night........	58·7	79·0	62·0	84·5	60·9	73·5
December—						
Day.........	70·4	62·3	74·7	60·5	77·8	48·5
Night........	61·9	79·0	65·0	87·0	66·0	69·5

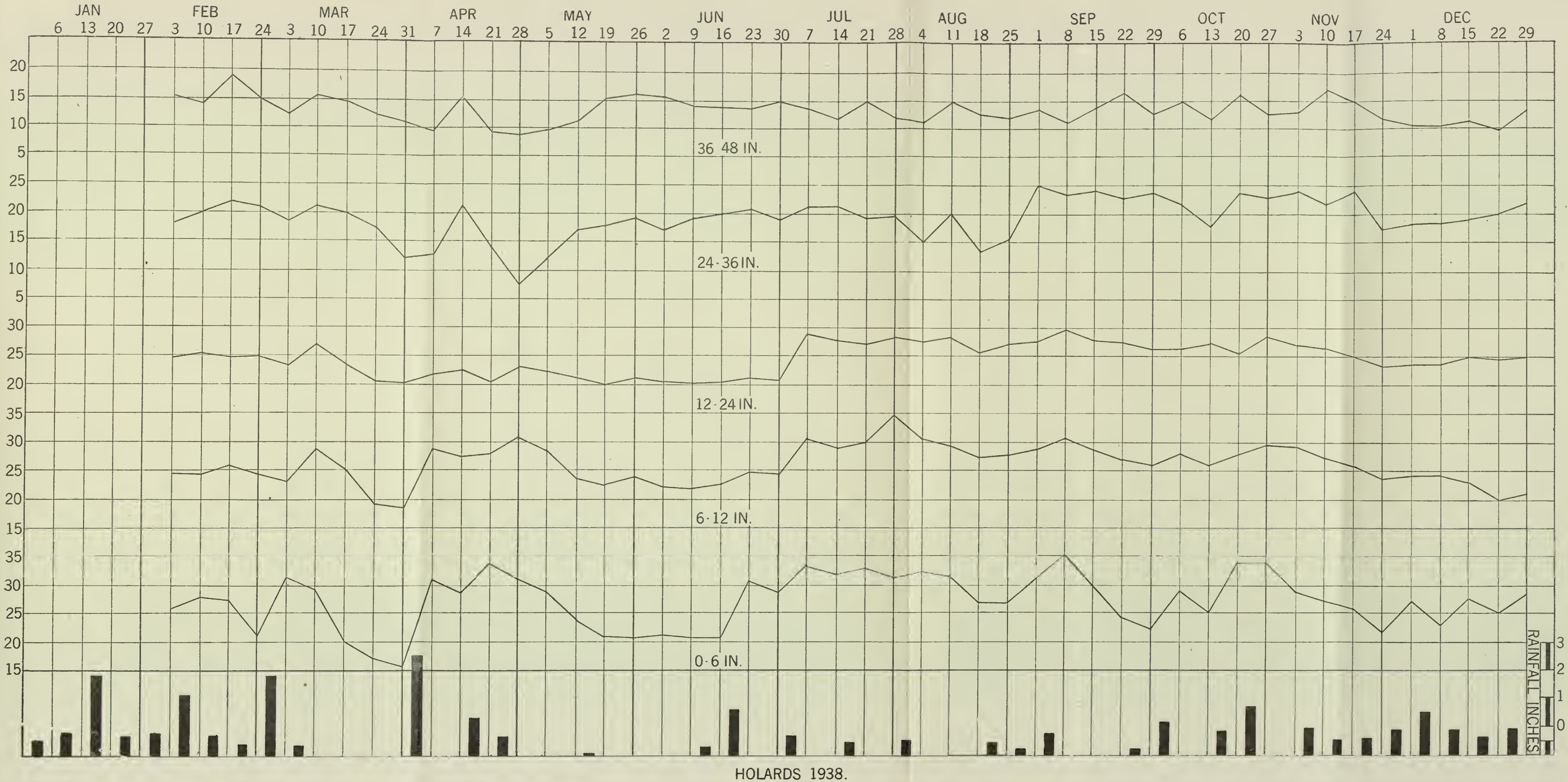
* No records available.



A North East Section through Weenen County from the Drakensberg, between Giants Castle and Cathkin Peaks, to the Tugela at Klip Berg, passing through Draycott and Frere.

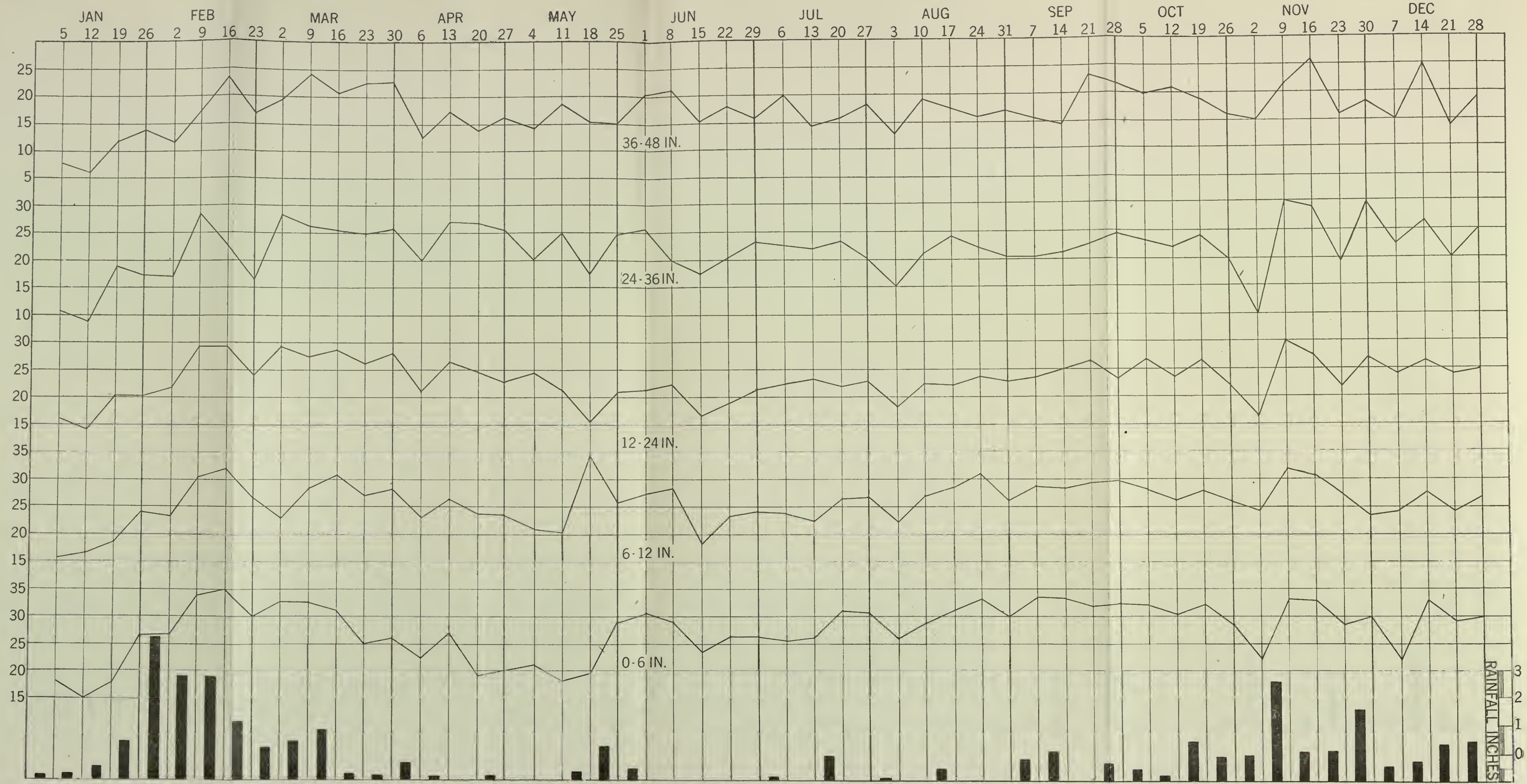
This section illustrates the terraced nature of the country.

(See pp. 1–3 and 11–16).



Graphs illustrating the Weekly Holard (Water content of the soil calculated as percentage of the dry weight of the soil) at different depths and the rainfall at the Estcourt Pasture Research Station during 1938.

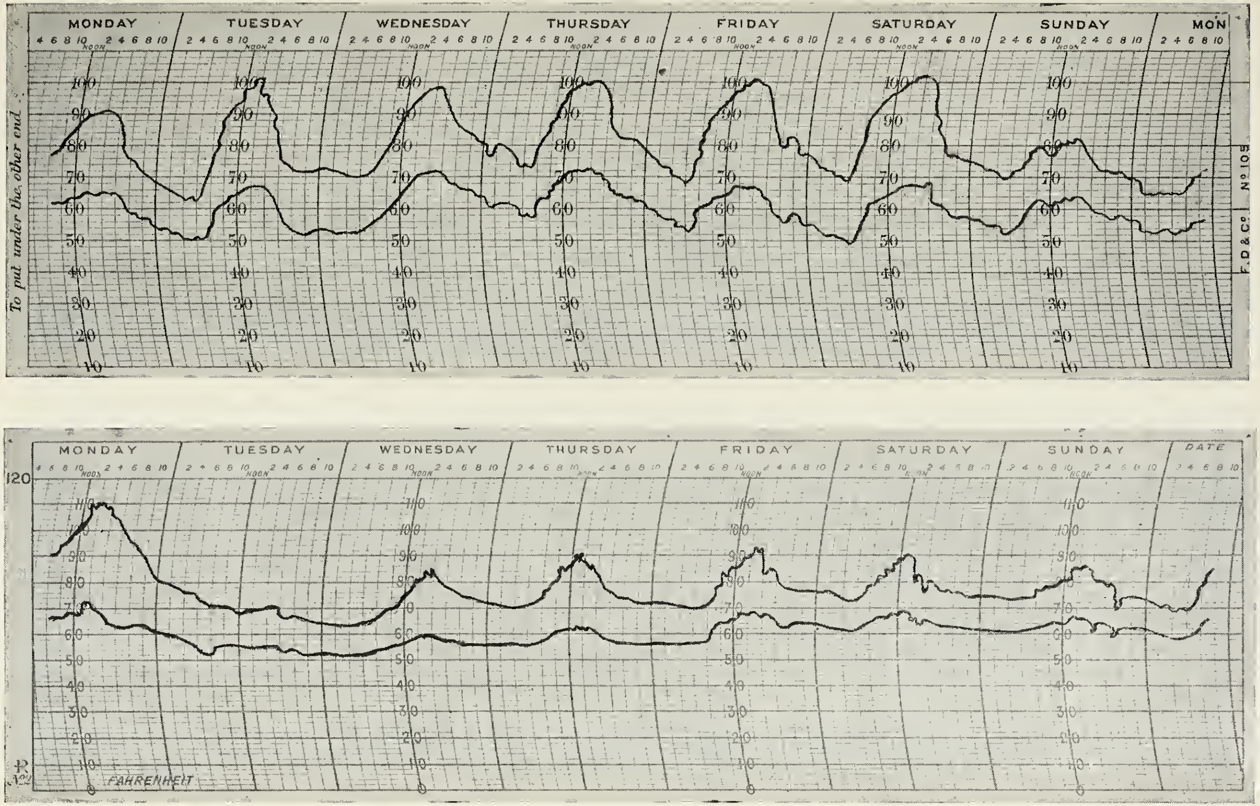
(See Chapter 4, Section 3, p. 21.)



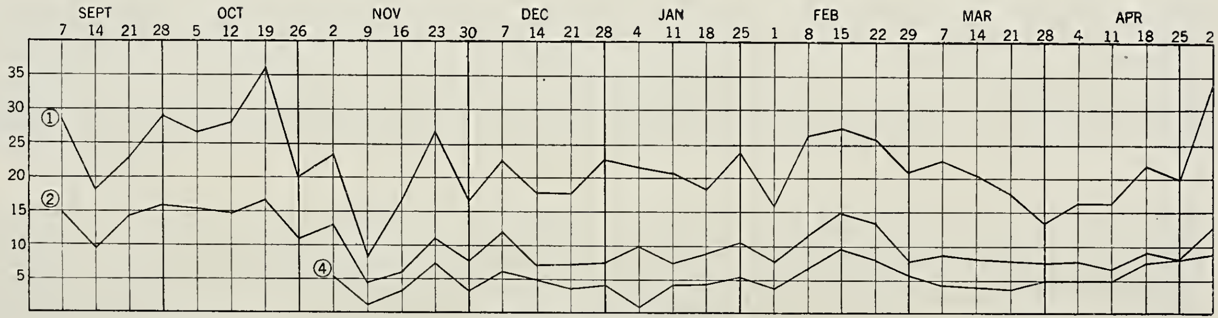
HOLARDS 1939.

Graphs illustrating the Weekly Holard (Water content of the soil calculated as a percentage of the dry weight of the soil) at different depths and the rainfall at the Estcourt Pasture Research Station during 1939.

(See Chapter 4, Section 3, p. 21.)



Thermo-hygrograph Charts. (Refer page 25, sections 6 and 7.)



AVERAGE DAILY EVAPORATION IN C.C.

The evaporating power of the air in differant plant communities at Estcouιt (see page 26).

CHAPTER V.

THE ALPINE VEGETATION.

The summit and steep slopes of the Drakensberg above the Little Berg Plateau have already been described as a distinct topographical region, which presents marked differences in climate and vegetation from the rest of Weenen County. This vegetation finds its best expression above 7,000 feet and where not interrupted by the precipitous basaltic cliffs, reaches to and covers the summit. The climax appears to be a Macchia in which, in addition to the dominant shrubs, grasses and sedges are important. As is usual on mountain ranges microclimatic variations caused principally by differences in slope and exposure have resulted in the production of patches of *post-climax* and *sub-climax* vegetation which interrupt the climax community and render the successional relationships of the various communities obscure.

Much work must be done before these relationships can be elucidated, and for this reason the classification of the four distinct communities described here is tentative.

The Macchia is largely confined to the beds of ravines and rocky areas which are afforded natural protection from the fires which occasionally sweep the area. It is considered that the grassland, which characterises the exposed slopes and much of the summit, is maintained by fire, which prevents its invasion by shrubs (Chapter VIII pp. 72–73). If this is so the Alpine Grassland constitutes a sub-climax maintained by fire and will be treated as such in the following description:—

1. The Danthonia—Pentaschistis—Festuca spp. Associes.

This sub-climax associes is dominated by *Danthonia* spp., *Pentaschistis* spp. and *Festuca* spp. and is described as the *Danthonia—Pentaschistis —Festuca spp. Associes.* At the Bushman's Pass, this associes covers an extensive tract of country at an elevation of 9,000 feet and more. It extends into Basutoland and down through the Pass into Natal, fading away at approximately 8,500 feet. It has been observed also on the steep slopes at the base of the precipice which caps Cathkin Peak, Monk's Cowl and Champagne Castle Peak at an elevation of about 9,000 feet. The lower limit seems to lie between 8,000 and 9,000 feet and the community is apparently well developed above this altitude, wherever the topography is mature enough to provide a sufficient depth of well-drained soil. (Photographs 3 and 4.)

Botanical Composition of the Associes.

At the summit where the community is best developed the grasses are dominant and from a very short close turf. The flowering stalks are about 8 inches tall and seldom exceed 12 inches. The most important grasses in the associes here are *Danthonia disticha, Pentaschistis oreodoxa, Festuca caprina* var. *macra, Festuca scabra, Poa binata, Agrostis barbuligera* and *Koeleria cristata. Helictotrichon galpinii* is common. *Danthonia drakensbergensis* seems to be confined to moist sites where it is often dominant.

In this summit grassland, forbs are few in number and unimportant. The most conspicuous are *Hesperantha* sp., *Gazania armerioides, Senecio* spp. and *Helichrysum* spp. The Macchia shrubs probably excluded by periodical fires are conspicuously absent.

On the slopes of the Pass below the summit where there is a certain amount of protection from the winds, the grasses grow taller, their flower heads attaining 24 inches, and a greater number of species become important. *Festuca caprina* and *Festuca caprina* var. *irrasa, Festuca* sp. (O.W. 1628, 1635, 1643, 1665), *Pentaschistis natalensis, Helictotrichon turgidulum, Ehrharta longigluma, Brachypodium bolusii, Anthoxanthum ecklonii, Bromus firmior* and *Aristida monticola* must be added to the list given for the summit. *Agrostis lachnantha* (in wet places) and *Agrostis bergiana* are common. Here too the sedges become important. *Schoenoxiphium sparteum* and *S rufum, Scirpus falsus* and *Luzula africana* are very frequent. Several *Carex* spp. occur. In moist and rocky areas where a certain amount of fire protection is afforded, the community is much more open and is enlivened by a large number of herbs and small shrubs. *Bulbine asphodeloides, Galtonia candicans,* several *Kniphofia spp., Rhodohypoxis baurii,* the large and handsome *Moraea spathulata* and other *Moraea* spp., *Aristea* sp., *Hesperantha* sp., *Watsonia* sp., *Gladiolus* sp. and many orchids are among the most conspicuous representatives of the monocotyledons.

Dicotyledonous plants too are present in great numbers and include *Thesium cuppressoides, Cerastium capense, Ranunculus* sp., the stem succulent *Crassula sarcocaulis, Buchenroedera lotonoides, Argyrolobium collinium, A. variopile, Lotononis galpinii, A. rupestre, Sutherlandia frutescens* var. *communis, Lessertia* spp., *Geranium ornithopodium, G. incanum, Pelargonium australe, Polygala myrtifolia, Rhus microcarpa, Alepidea amatymbica, Lichtensteinia* sp., several *Erica* spp., *Schizoglossum elingue, Myosotis sylvatica, Diascia cordata, Nemesia* sp., *Manulea crassifolia, Sutera aurantiaca, Zaluzianskya* spp., *Hebenstreitia dentata, Selago immersa, Wahlenbergia zeyheri* and many composites among which may be mentioned *Helichrysum latifolium* and other *Helichrysum* spp., *Macowania pulvinaris, Athrixia fontana, Eumorphia sericea, Senecio* spp. and *Berkheya* spp.

2. The Bromus Firmior—Other spp. Consocies.

At Bushman's Pass and below Giant's Castle this community is well developed and extensive. It lies between 7,000 and 8,000 feet, that is from the beginning of the steep slope to the lower limits of the *Danthonia—Pentaschistis—Festuca* spp. Associes. It has been observed too in the valley below Cathkin Peak and Champagne Castle Peak at about the same altitude, and on the southern slope of Champagne Castle. The broad-leaved *Bromus firmior* growing in the form of large round tussocks dominates the community. Narrow-leaved grasses occupy the spaces between the tussocks. Most of the species listed for the *Danthonia—Pentaschistis—Festuca* spp. Associes occur, but prominent is a narrow-leaved *Pentaschistis* sp. (O. W. 1650). Sedges are frequent and a low growing form of *Erica woodii* is often sub-dominant. Other *Erica* spp. as well as *Rhus microcarpa* occur. (Photograph 7.)

There is a striking difference in the texture and appearance of the leaves of the dominant grass, depending on its habitat. On slopes exposed to full insolation the leaves are heavily cutinized and are very hard and

stiff. On the mesocline slopes facing south and south-east, which are exposed to direct sunlight for a portion of each day only, the leaves of *Bromus firmior* are less heavily cutinized and are of much softer texture. It should be noted that *Bromus firmior* flowers readily on the mesocline slopes, but on the xerocline, the apparently similar broad-leaved grass has not been found in flower and so there is a possibility that it may be a different species.

3. Post-climax Grassland.

In particularly favoured situations where the topography and aspect combine to provide a sufficiently warm, protected habitat, patches of *Trachypogon—Themeda—Other spp. Grassland* (Undisturbed Veld) are found well above the normal altitudinal range of this grassland community. Bushman's Pass is extremely bleak and exposed and there this type of grassland is very limited. Tiny patches are to be seen on the slopes of gullies facing north. The patches usually begin a yard or two below the lip of the gulley and are never extensive.

On the buttress slopes of Champagne Castle very different conditions obtain. Here the slopes face north and are protected from wind by the neighbouring peaks, Cathkin, Monk's Cowl and the Gatberg spur, and on this post-climax grassland is well developed and extends almost to the foot of the great krantzes, to an altitude of over 9,000 feet. A small form of *Trachypogon capensis** is frequent, together with *Themeda triandra, Andropogon amplectens, Harpechloa falx, Koeleria cristata, Eragrostis caesia, E. chalcantha* and *E. capensis.*

The Trachypogon flower heads may be as much as 27 inches tall and the Themeda 20 inches.

4. The Succession and the Shrub Climax.

The *Hydrosere* is not much in evidence in this region—springs, gullies carrying running streams and small flushes comprise the areas. They are marked by lush growths of flowering plants. Several *Kniphofia* spp. are conspicuous. *Ranunculus cooperi* with large orbicular leaves, like those of Gunnera, forms dense consocies as do *Alepidea amatymbica,* forma and *Lichtensteinia* sp. (=Thode A223). *Myosotis sylvatica* is always present and makes a very gay show with *Nemesia* and *Diascia* spp. Large yellow-flowering *Berkheya* spp. and various *Erica* spp. are common, as well as most of the other forbs listed for the *Alpine Grassland Association.*

Agrostis lachnantha and *Danthonia drakensbergensis* are common grasses in these wet sites.

The *Lithosere,* as would be expected, is prominent. The initial bare areas are rock surfaces represented by the great krantzes and the rocky summit or edge of the Berg, as well as rock exposures and talus on the slopes. The succession on rock surfaces is initiated by Blue Green Algae followed by lichens. The reactions of these pioneer communities produce a substratum of disintegrated materials suitable for colonisation by the Bryophyta, which follow the lichens and which by disintegrating further rock material, collecting wind and water borne material as well as adding considerable amounts of organic matter, prepare the way for other plants.

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* *Trachypogon capensis* (Thunb.) Trin. [= T. plumosus (Kunth.) Nees].

Bews (1917) gives an account of this succession. The Blue Green Algae comprise *Stigonema informe* Kutz forma; *S. hormoides* Bornet et Flahault forma; *Schizothrix muelleri* Naeg.; *S. epiphytica* F. E. Fritsch; *Calothrix parietina* (Naeg.) Thun. var. *africana* F. E. Fritsch; *Gloeocapsa sanguinea* Kutz.

Heliophilus Bryophyta.

Camphylopus chlorotrichus C.M.; *Grimmia apocarpa* Hedw.; *Tortella caespitosa* Scav.; *Brachymenium pulchrum; Andrea* sp.

Ombrophilous Species.

Plagiochila corymbulosa Pears.; *P. javenica* N. & M.; *Thuidium tamariscinum* Hedw.; *Macromitrium lycopodioides* Burch.; *Trullania diptera* Nees; *Brachythecium* sp.; *Orthotrichum* sp.; *Didymodium* sp.; *Hyphnum cupressiforma* L.; *Bryum stellipilum* C.M.; *Rhodobryum synthrichioides* (C. M.) Par.

Rock Crevices.

Papillaria floribunda C. M.; *Papillaria* spp.; *Philanotus* sp.; *Lejeuna flava* L.; *Weisia viridula* L.; *Rhodobryum syntrichioides* (C.M.) Par.; *Fissidens taxifolius* (L.) Hedw.; *Brachythecium* sp.; *Fimbriaria marginata* Nees; *Thuidium angustifolium* Jacq.; *Madotheca capensis* G.; *Lejeunea striata* Nees; *Plagiochila spinulosa* (Dicks) Dum.; *Mnium punctatum* L.; *Bryum umbraculum* Burch.; *B. bimum* Schrab.; *Tortella caespitosa* (Schw.) Sempr.

(Lists of Cyanophyceae and Bryophyta from Bews, 1917.)

The Bryophyta are most important in sheltered and moist sites. *Selaginella rupestris* is common and appears very early in the succession. It is an important soil builder on exposed rock surfaces. The reactions caused by the pioneer Blue Green Algae, Lichens, Mosses and Hepatics produce a suitable substratum for higher plants and soon they are followed by various ferns and a great variety of flowering plants.

The water relations of the habitat at this stage are very varied. In drier sites various grasses, sedges, flowering monocotyledons and dicotyledons, particularly Leguminosae, Ericaceae and Compositae are prominent.

On the rocky summit between Bushman's Pass and Giant's Castle (altitude 9,500 feet and over) the following plants were noted in this community: *Danthonia disticha, Pentaschistis* sp. (O. W. 1728), *Festuca caprina* var. *macra, Festuca scabra* and *Koeleria cristata, Scirpus falsus, Rhodohypoxis baurii, Hesperantha* sp., *Crassula galpinii, Lotononis galpinii, Lessertia* sp., *Geranium incanum* var. *purpureum*, the minute *Wahlenbergia stellarioides, Psammotropha* sp., several woody *Erica* spp. and many Compositae including *Helichrysum trilineatum* var. *tomentosum, H. adenocarpum* var., *Senecio gramineus, Schistostephium* sp. and the shrubby *Macowania pulvinaria* and *Eumorphia sericea. Moraea spathulata* was very prominent on the summit but was confined to moist and sheltered sites.

As the succession progresses, the amount and depth of soil increases and if the area is exposed to fire, the grasses become increasingly important. Eventually they establish dominance and the mixed grass and forb seral communities give way to the sub-climax Alpine grassland.

In areas afforded some measure of protection from fire, the shrubs maintain dominance and give rise to a type of macchia dominated by shrubby *Erica* spp. and Compositae and containing all of the forbs already listed for the seral communities and for the sub-climax grassland. A particularly good example of the " Macchia " can be seen on the slopes of Champagne Castle Peak, in the glen between Champagne and Cathkin at about 7,000 feet and over.

Prominent are *Protea hirta* and *Encephalartos ghellinckii,* species which are apparently confined to the lower slopes and do not occur at the summit. The Protea attains a maximum height of about 4 feet and is abundant throughout the community. The tallest Encephalartos are between 5 and 6 feet in height and appear, from counts made of the leaf scars to be from 50–80 years of age. Many of the oldest specimens have recumbent trunks. In all, there are thousands of plants of all ages. During April 1938, ripe female cones were seen and many of them were found torn open by baboons, which must play an important role as disseminating agents. Associated with the Protea and Encephalartos are many sclerophyllous shrubs. (Photograph 6.)

Cliffortia nitidula, C. filicauloides, Lotononis cytisoides, Rhus microcarpa, Erica ebracteata, Erica thodii and other *Erica* spp., *Myrsine africana* and many shrubby Compositae including *Athanasia montana, A. punctata, Gymnopentzia pilifera, Euryops lateriflorus, Helichrysum gymnoconum* and *Berkheya discolor* are found. Bracken is abundant and forms dense consocies and there are numerous associated grasses, including *Cymbopogon marginatus,* patches of *Trachypogon capensis, Themeda triandra,* much *Aristida monticola* and *Danthonia macowani.*

5. Discussion.

It is strange that in the literature at my disposal there is little or no reference to the Alpine Grassland, which has just been described. Justus Thode, who explored this part of the Drakensberg as early as 1893, described it as " The Upper Mountain or Sub-Alpine Region " of Natal (7,000–10,000 feet) characterised by *Helichrysum* spp. and *Erica* spp.

From his account it is obvious that his interest was centered in the flowering plants rather than in the grasses or plant communities. It is interesting to note that he remarks on the presence of *Encephalartos ghellinckii* on the slopes of Cathkin Peak at nearly 8,000 feet. He says that he did not see the spadix. (Thode 1901.)

Galpin (1908; 210) describing the vegetation of a portion of the Drakensberg in the neighbourhood of Maclear (Cape Province) remarks that " *Festuca caprina* Nees, locally known as ' Bokbaard ' a grass remaining green through the severe winter, yields excellent herbage on the mountain slopes "; (Galpin 1908; 209) further " on the eastern shoulder of Ben McDhui, at an altitude of 9.400 feet *Anthistiria imberbis* Retz (*Themeda triandra* Forsk.) which was not met with at any other spot on the Highlands, has possession of the veld ". It is apparent too, that the *Bromus firmior*—other species consocies was encountered. Galpin refers to it

in the following terms: "Travelling in a north-easterly direction the summit of the Drakensberg was reached again, and the Satsanna Berg (alt. about 9,550 feet) explored. This is due North of Doodman's Krans. Fields of *Bromus firmior* Stapf, a handsome grass $2\frac{1}{2}$–3 feet high were met with (Galpin 1908; 210).

Galpin records *Bulbostylis* sp. on Ben McDhui 9,300 ft. summit of Doodman's Krans Mtn. 9,650 ft. and Ben McDhui alt. 9,850 ft., *Carex bolusii* C. B. Clarke, Summit of Doodman's Krans alt. 9,650 ft., Carex *clavata* Thb., Doodman's Krans Mtn., 8,650 ft. *Carex drakensbergensis* C. B. Clarke, Ben McDhui, 9,000 ft. *Andropogon appendiculatus* Nees, Ben McDhui, 9,900 ft., *Anthistiria imberbis* Retz, Ben McDhui, 9,400 ft., *Anthoxanthum dregeanum* Stapf, Ben McDhui, 9,000 ft., *Aristida junciformis* Trin. et Rupr., Ben McDhui, 9,400 ft., *Sporobolus* sp. (?) summit of Doodman's Krans Mtn., 9,650 ft., *Agrostis barbuligera* Doodman's Krans Mtn., 9,300 ft., *Agrostis* sp. Ben McDui, 9,600 ft., *Achneria setifolia* Stapf, summit of Doodman's Krans Mtn., 9,650 ft., *Achneria* sp. (nearest to *A. microphylla* Dur. et Schinz), Ben McDhui, 9,900 ft., *Avenastrum* sp. (near *A. antaraticum* Stapf) Ben McDhui, 9700 ft., *Danthonia* sp. (nearest *D. papposa* Nees) summit of Doodman's Krans Mtn., 9,150 ft., *Pentaschistis* sp. (?) perhaps forms of *Danthonia disticha* Nees), Doodman's Krans Mtn., at 8,500, 9,200 and 9,650 ft., *Harpechloa capensis* Kth., summit of Doodman's Krans Mtn., 9,650 ft., *Koeleria cristata* Pers., Ben McDhui 9,900 ft., *Eragrostis caesia* Stapf, Ben McDhui, 9,400 ft., *Melica bolusii* Stapf, summit of Doodman's Krans Mtn., 9,650 ft., *Poa binata* Nees, Ben McDhui, 9,650 ft., *Festuca caprina* Nees, Doodman's Krans Mtn., Ben McDhui, etc., 8600–9,900 ft., *Festuca scabra* Vahl, Ben McDhui, 9,600 ft., *Bromus firmior* Stapf, summit Drakensberg between Doodman's Krans Mtn. and Satsanna Berg, 8,600–9,550 ft., *Brachypodium bolusii* Stapf, Satsanna Berg, 9,250 feet.

This list agrees remarkably with that given for the Alpine Grassland on Bushman's Pass.

Bews (1917, 511–65) describes "The Vegetation of the Mountain Top" growing on detritus formed in situ. "On the whole it may be described as a mixture of heaths and composites with tufted grasses and a variety of other associated plants." It is apparent that Bews never encountered the Alpine Grassland proper. His "mountain tussock veld" (Bews 1917; 1918, 138–140; 1925, 110) in no way resembles the Alpine communities. The grass genera which make up the Alpine Grassland are usually regarded as constituents of the S. W. flora, where they are well developed, but as pointed out by Bews, "entirely subordinate to the Macchia shrubs, though occasionally various species of *Danthonia* or *Pentaschistis* are dominant over small patches (*in early stages of the succession*)". (Bews 1925, 157.)

On the Drakensberg these grasses fill a more important role and are able when assisted by periodical fires to establish a grassland subclimax which covers extensive areas and is, under existing conditions, a much more important vegetation than the Macchia to which it would apparently develop, if protection from fire is afforded.

His study of the plant ecology of the coast belt of Natal led Bews to observe that "In a subtropical region, as the sucession advances, the vegetation becomes more and more tropical". (Bews 1920, 381–388).

Phillips in the Knysna area found the same trend in the succession. " In a temperate sub-tropical region—such as that extending along the coast from the Cape Peninsula to near Humansdorp, Cape Province—I found that as the succession advances the vegetation becomes more and more sub-tropieal " (Philips 1934; 567).

On the summit of the Drakensberg the apparent succession under existing conditions is Alpine Grassland→Temperate Macchia. At lower elevations in this area the Machia develops to Evergreen (Mountain) Forest which floristically is more tropical than Temperate. This obtains too in the Knysna forests where Phillips describes Temperate Macchia developing to sub-tropical Forest. (Phillips 1931; 203). Thus we have:— Alphine Grassland→Temperate Macchia→Sub-tropical Forest.

It is suggested that in the development of the climax (Biotic Community) as in the development of the simple organism, ontogeny to some extent repeats phylogeny and that the Temperate or " South Western " grass communities on the Drakensberg may be relics of a temperate or sub-temperate vegetation which existed over wide areas when the climate was very different and which is preserved in a fragmentary state on the elevated summits of the Drakensberg.

CHAPTER VI.

EVERGREEN MOUNTAIN FOREST.

In Weenen County patches of Evergreen Forest occur principally on the steep southeast, south and southwest aspects of the hills which arise from the Tabamhlope Plateau, and on the escarpment which separates the Tabamhlope and the Little Berg Plateaux. Small patches are found in suitable sites on the Draycott escarpment. The forests usually lie at altitudes varying from 5,000 ft. to something over 6,000 ft. They occupy areas where natural features afford a measure of protection from fire and where, because of exposure and slope, the holard is increased and temperature conditions are less extreme than on the plateaux and hill tops.

Abundant evidence in the shape of relic patches of forest and scrub indicates that the existing forest patches are relics of forests which were formerly of considerable extent. Further there is much evidence to show that the grassland which at present covers the Little Berg and Tabamhlope Plateaux is in reality a sub-climax, caused principally by fire and that if this grassland was afforded protection from fire, overgrazing, tramping etc., it would develop towards forest. (See Grassland Chapter VIII.)

1. History and Extent of the Forests.

Fourcade (1889) states that High Timber Forests in the County of Weenen were estimated by the Forest Commission of 1880 to cover 6,400 acres on Crown Land, and a like extent in Native Locations, and on privately owned land, while now (1889) these estimates reduced by half would be more accurate. "Whether it is that the estimate of 1880 was too high, or that denudation has been very rapid since, cannot be ascertained definitely." He lists: (1) "A few small forests" above the farm Meshlynn near the sources of the Mooi. (2) The Hlatikulu Forest—one of the largest in the country and about 600 acres in extent. (3) A piece of forest 40 acres in extent on the north slopes of Hlatikulu Mountain near the summit. (4) On Table Mountain about 8 miles to the north of Hlatikulu. "A small strip of scrub composed chiefly of Greyia and Leucosidea" near the top on the south side, and several small forests in depressions of the hillside at a lower elevation. (5) In the Zikali Location numerous small forests occupy deep gorges in the north flanks of the Drakensberg Mountains which here reach their highest elevation between Cathkin Peak and Mont-aux-Sources.

At this time and previously, denudation was proceeding at a great rate. Referring to the Hlatikulu Forest, Fourcade says:—

> "Wagon wood was formerly cut on a large scale under the £1 a month system and with the exception of hard pear there now remains very little useful timber."
>
> "The forest is supposed to be in charge of one Saponse, a Native. Saponse states that he was placed at the forest by Mr. Wheelwright, the former magistrate, to prevent people cutting without permits. He could not say that he had seen a permit for the last 3 or 4 years, though wattles, poles and kraalwood appear

to have been cut out largely since that time. I believe that the chief destruction has been effected by this native, who has mealie gardens in bush ground recently burned by himself, and still full of charred stumps for a hundred yards or more from the present limits of the forest. Numbers of natives are said to be constantly removing wood; they cut the timber trees down and use the wood after it has become dry in the forest. I myself saw several hard pear trees that had been recently cut for the purpose. The natives are accustomed to drive for game in this forest, and bucks are almost extinct."

This destruction of forests was not confined to Hlatikulu. He states that "The most accessible forests have been cut out or nearly so and Kaffir cultivation and wattle cutting have served to damage the greater number."

The destruction described by Fourcade has been carried very much further since 1889 and the forests in or closely adjoining native locations have been mercilessly exploited. Although control is very much more effective now, the damage in many instances has been done and the forests almost irreparably ruined. The forests listed still exist but an examination of their margins shows that the majority were formerly much more extensive than now.

It is worth noting that the "small strip of scrub composed chiefly of Greyia and Leucosidea" on (Table Moutain) Tabamhlope is in reality a strip of forest sadly exploited but still showing some very fine big trees. It is a relic of what must once have been an extensive forest reaching down the slopes of Tabamhlope to the Umcheszaan. Relic patches of another forest are to be seen on the northern side of the Bushman's Valley above Dalton Bridge. (Photographs 15 and 21.)

2. Composition and Description of the Forest.

As has been stated, the forests are all sadly exploited. Selective felling has not only reduced the number of large trees, but has had a very marked effect on the proportion of the constituent species. Typically the forest is a very mixed association with no definite dominants.

Podocarpus latifolius is usually prominent and is largely responsible for the characteristic irregularity of the canopy, from the general level of which its dark-foliaged crowns project a little.

Associated with *Podocarpus latifolius* are fair sized trees of: *Olea laurifolia, Olinia cymosa, Kiggelaria africana, Ilex mitis, Rapanea melanophloeos, Cussonia spicata, Scolopia mundtii* and smaller trees of *Trimeria grandifolia, Halleria lucida, Heteromorpha trifoliata, Pittosporum viridiflorum, Royena lucida, Gymnosporia acuminata, G. albata, G. peduncularis* and *G. buxifolia.*

Common trees in the forest margins are *Gymnosporia* spp., *Euclea natalensis, Rhus* spp., *Rapanea melanophloeos, Pittosporum viridiflorum, Halleria lucida* and *Cussonia spicata.*

Under the trees fairly tall mixed shrub layer societies are formed by *Clausena anisata, Royena cordata, Rhamnus prinoides, Grewia* spp., *Carissa bispinosa, Plectronia ciliata, Cluytia pulchella, Cassinopsis capensis* and *Myrsine capensis* (more open aspects).

The trees in these mountain forests are not very tall and seldom exceed 50 ft. in height. *Podocarpus latifolius* often exceeds 50 ft. with boles measuring more than 10 ft. in circumference at breast height. Large specimens of *Ilex mitis* do not fall far short of this, while *Kiggelaria africana* attains a height of about 40 ft. with a circumference of just over 7 ft.

Ground Vegetation.

The forest floor is usually covered by a fairly dense ground vegetation. Ferns are often important and include: *Selaginella capensis, Lycopodium verticillatum, Polystichum aculeatum, Dryopteris bergiana, D. pentheri, Blechnum attenuatum, Asplenium sandersonii, A. monanthes, A. praemorsum* var. *tripinnatus, Mohria caffrorum, Pteris cretica* and others.

The Gramineae and Cyperaceae are represented by: *Ehrharta erecta, Stipa dregeana, Schoenoxiphium rufum* and *S. sparteum;* of the monocotyledons, *Chlorophytum elatum* forms extensive layer societies; *Haemanthus magnificus* and *Moraea iridioides* are very common. Herbaceous layer societies are formed by *Stachys grandifolia, Hypoestes* spp.,*Sparmannia ricinocarpa, Solanum indicum, S. aculeatissimum, Adenocline mercurialis, Polygala confusa* and many others.

The forest floors are very rocky and the numerous large boulders exhibit an interesting flora. Numerous lichens, liverworts, mosses and ferns are represented together with: *Peperomia retusa, P. reflexa, Impatiens marlothiana, Begonia sutherlandi* and *Streptocarpus gardeni.*

The following mosses are common in these situations: *Atrichum androgynum* (C. M.) Jacq., *Bryum truncorum, Hedwigia albicans* (Web.) Lindb., *Brachymenium pulchrum* Hook., *Minum rostratum* Schrad., *Leucodon assimilis* (C. M.) Jacq., *Entodon dregeanus* (Horm.) C. M.

Epiphytes are poorly represented both as to species and numbers of individuals. Besides the numerous liverworts, mosses and lichens found on boles, trunks and branches they comprise various ferns such as *Polypodium lanceolatum L.* and *P. polypodioides* (Linn.) Hitch., the grass *Ehrharta erecta*, several orchids and *Peperomia reflexa,* and *P. retusa*. *Usnea barbata,* the lichen responsible for the characteristic bearded appearance of forest trees at Knysna and in the Eastern Province is rare.

Creepers and lianes, so abundant in coastal forest, are not conspicious. They include: *Asparagus* spp., *Dioscorea* spp., *Clematis brachiata, Rhoicissus cuneifolius, Trimeria grandifolia,* which occasionally behaves as a half climber, *Senecio mikanoides, S. quinquelobus, Bowiea volubilis Fumaria officinalis, Rhynchosia reptabunda* (in Macchia), *Riocreuxia tortulosa, Coccinea* sp. and *Melothria punctata.* The first seven are woody.

3. Principal Seral Communities—Forest Succession.

(A) *Protea open woodland. The Protea caffra or P. roupelliae consocies.*

This striking community is well developed on the Little Berg Escarpment, particularly on the steep slopes and terraces formed by the Molteno and Red Beds beneath the spectacular cave sandstone krantzes. It occupies inaccessible country which is unequalled for rugged grandeur and lovely panorama. The community consists of small shapely trees,

widely spaced in grassland and is usually a consocies in which the dominant is either *Protea caffra* or *Protea roupelliae*, though sometimes the two species intermingle to form a *Protea* spp. associes.

Of the two consocies, the *Protea caffra* consocies is the more important and covers the largest area. Protea open woodland may be compared with Acacia savanna (the Acacia Species Associes). The structure is very similar and in both communities the dominant trees are very seldom damaged by fire and when they become dense enough, minimise the effects of fire and allow the development of the next stage in the succession. (Photographs 10, 12 and 15.)

(B) *Macchia or Fynbos.*

When grassland or Protea open woodland is afforded protection from fire there is an influx of small shrubs. Often the tall *Cymbopogon marginatus* becomes very prominent. Eventually the community becomes a dense "Macchia" composed of such species as *Schistostephium hippiaefolium, Athanasia punctata, A. montana, Artemesia afra, Gymnopentzia pilifera, Euryops lateriflorus, Helichrysum gymnocarpus, Vernonia corymbosa, Senecio isatidioides, Cluytia pulchella, Berkheya discolor, Polygala virgata, Leonotis* sp., *Geranium ornithopodium, Myrsine africana, Asparagus* sp., *Rubus* sp., *Phylica paniculata, Passerina* nov. sp. (?) (O. W. 1392), *Cliffortia nitidula, C. filicauloides, Erica ebracteata, Erica thodei* and other *Erica* species. Bracken is common and forms dense consocies and *Protea hirta* is important at high altitudes.

Encephalartos ghellinckii is conspicuous in this community on the slopes of Champagne Castle Peak and has been noted in several localities in Macchia just under the Cave Sandstone. (Photograph 6.)

The community is dense and often there are no clearly dominant species. The height varies considerably, but it does not usually exceed 4 feet. It is responsible for bringing about important changes in the edaphic and atmospheric factors, stabilizing them and rendering the habitat less extreme.

As the succession progresses the Macchia is invaded and eventually suppressed by taller trees and shrubs. Where Macchia has developed in Protea Open Woodland, the Protea trees are eventually suppressed too.

The invadors are *Buddleja salvifolia* and *Leucosidea sericea.* Those species may give rise to an associes or more usually to consocies in which one or the other is dominant.

(C) *The Buddleja salvifolia Consocies.*

Buddleja salvifolia is an ornamental shrub or small tree. It forms a dense consocies which develops in and eventually suppresses Macchia located on the more zeric sites. It usually forms a fringing zone on the upper margins of existing forest patches. The community is dense and occasionally attains a height of about 20 ft. but 8–10 ft. is more usual.

(D) *The Leucosidea sericea Consocies.*

This rosaceous tree forms a dense and often extensive consocies which develops in the Macchia located on the moister sites. It is usual along stream banks and forms fringing zones along the lower margins of

existing forest patches. The usual height of the community is between 10 and 12 ft. but occasional trees are taller. One measured in the Tabamhlope Forest, exceeded 30 ft. in height, with a bole diameter of 3 ft. Usually the trunks are clean, but fire injury when young causes them to branch near ground level. In a quadrat 21 × 21 ft. in this consocies on Tabamhlope mountain, there are 10 trees between 10 and 12 ft. in height with an average bole diameter of 18 inches. One tree has six branches at ground level, one has three and two have two. (Photographs 1, 5, 8 and 12.)

(E) *The Leucosidea—Buddleja Associes.*

The *Leucosidea sericea—Buddleja salvifolia* associes develops in Macchia on sites where the average holard is medium. It is not an extensive association but develops towards forest more rapidly than either of the consocies.

(F) *The Widdringtonia dracomontana Consocies.*

This small tree forms consocies, which are sometimes of considerable extent, at the upper limits of Evergreen Forest on the Little Berg Escarpment. These consocies often cover areas where the soil is very shallow and represent a late and persistent stage of the xerosere (lithosere). *Widdringtonia dracomontana* is seldom found much below the bottom of the Cave Sandstone and, unlike *Leucosidea sericea,* it does not persist along the streams on the Little Berg Plateau.

(G) *The Greyia sutherlandi Consocies.*

Greyia sutherlandi, a handsome flowering tree, (sometimes a large shrub), has a wide distribution in Weenen County, occuring from below the Cave Sandstone on the Little Berg Escarpment to the Thorn Veld below Weenen, where it grows on krantzes situated on mesocline hillsides. It is particularly prominent on mesocline hillsides on the Draycott Escarpment in which area it plays an important part in the forest succession, forming consocies, which are seral to Evergreen Forest. (See photograph 22.)

(H) *Ground Vegetation.*

The ground vegetation within these communities is usually luxuriant and in summer presents a gay show of flowers which adds considerably to the beauty of the sheltering community. This is particularly striking in the Leucosidea consocies which presents a dark green exterior, the uniformity of which is rather uninteresting. Within, the picture is remarkably different. The grey lichen-covered trunks reach out of a mass of green undergrowth often composed largely of Asparagus and ferns. The mass of greenery is bedecked and entwined by many flowers of *Zantedeschia albomaculata,* masses of blue *Myosotis sylvatica,* occasional poppies and the tall inflorescence of *Galtonia princeps.*

(I) *Reaction and Development.*

Aerial Factors.—The light intensity is considerably reduced. Rate of evaporation is much reduced and humidity is increased.

The diurnal range of temperature is lessened, the maximum temperatures being lower and the minimum higher than without the community.

The difference between the sun temperature outside and the shade temperature within the community on a hot day is particularly striking. Uncomfortably hot in the sun outside, one feels too cold within the shade of a Leucosidea wood to rest over long.

Edaphic Factors.—The community reacts strongly on the soil, completely changing its nature and building it up by the accumulation of plant remains and the resultant addition of organic matter. Increase and stabilisation of the average holard is brought about by the addition of humus and by the decrease in the rate of evaporation and run-off and by the condensation of water on the foilage.

These changes make possible the establishment of the first members of the Evergreen Forest Association: *Rapanea melanophloeos, Rhus* spp., *Halleria lucida, Pittisporium viridiflorum, Euclea natalensis* and *Gymnosporia* spp. make their appearance and eventually dominate and entirely suppres the pioneer "nurse" communities.

CHAPTER VII.

THE SEMI-DECIDUOUS BUSH.

The climax vegetation in the topographical area described as the River Valley System or Thornveld is Semi-deciduous Bush. This is a very mixed community with a large number of co-dominant species. Its typical structure is a bush composed of small trees and shrubs (in contrast to forest composed of large trees) growing close together to form a more or less continuous or closed canopy. There are, however, considerable differences in the structure, depending largely on the stage of development reached by the community and on the occurence of fires. Examples illustrating every gradation from tree veld or Savanna, where the individual trees are fairly widely spaced in grassland to forest-like closed bush are to be found in the area. The community is part of an important formation, well developed in Natal and Zululand. It corresponds with what Bews (1912) calls " the Thornveld Formation " of the " Lowveld ". The " Deciduous Short Tree Savanna " of Bayer (1938) and Adamson's " Acacia Grassland " and " Bush Clump community of Temperate Savanna " (Adamson 1938). The community described by Phillips (1931) in Tanganyika as " Semi-deciduous Thicket " is apparently very similar structurally.

It is of interest that Bews, Bayer and Phillips all note the tendency to form Bush Clumps or thickets exhibited by the opener types of this vegetation when afforded protection from fire.

Adamson (1938) too, states that the " Bush clump community " is closely allied to Acacia grassland and connected to it by every stage of transition, but he regards the Bush Clump Community as being really in the nature of a local development.

1. Composition of the Association.

The light demanding *Acacia* spp. and *Dichrostachys glomerata* characteristic of the seral stages, do not form part of the climax Association, the principal constituent species of which in Weenen County are:—

Trees and Shrubs.

Acokanthera venenata, Boscia albitrunca, Brachylaena elliptica, Calpurnia subdecandra, Capparis citrifolia, C. guenzii, Clerodendron glabrum, Commiphora harveyi, Cussonia spicata, Cassine kraussiana, C. aethiopica, Euclea lanceolata, Gymnosporia buxifolia, Gymnosporia spp., *Grewia occidentalis, Heeria paniculosa, Heteromorpha triphylla, Hippobromus alata, Lycium pendulinum, Mimusops obovata, Maerua caffra, Olea chrysophylla, Pappea capensis, Plectronia mundtiana, Rhus dentata, R. pentheri, R. macowani, Royena pallens, Rhamnus zeyheri, Randia rudis, Scolopia ecklonii, S. zeyheri, Schotia brachypetala, Tarchonanthus camphoratus, T. minor, Vangueria infausta, Vepris lanceolata, Vitex rehmanni, V. mooiensis, Ximenia caffra* and *Zizyphus mucronata.*

Characteristic of river banks, water courses, etc., are: *Calodendrum capense, Celtis kraussiana, Combretum glomeruliflorum, Dais cotinifolia, Ficus* spp., *Olinia acuminata, Rhus gerrardi* and *Rhus legati.*

Sandstone krantzes often harbour species which are much more prominent there than elsewhere. Characteristic are a variety of *Ficus* spp. and *Croton gratissimus.*

Succulent trees are common. *Euphorbia tirucalli* is often frequent and sometimes dominant in quite dense bush. *Euphorbia ingens* and *E. triangularis* are often important dominating small communities, probably developmental. *Aloe spectabilis* is characteristic of the more open areas and bush margins. In dense bush it is replaced by *Aloe nitens.* The very tall *Aloe bainesii* forms small communities in dense bush.

Zizyphus mucronata is confined to the opener aspects and margins, though large trees may survive in denser bush. *Tarchonanthus camphoratus* is sometimes dominant on hillsides. *Commiphora harveyi* occurs throughout forming small consociations. *Greyia sutherlandi* forms consocies on krantzes. *Protea flanagani* occurs in this association, growing in the bush margins on the farm Schurfdepoort on the Tugela below Colenso.

It is extremely difficult to indicate the importance of the various constituents because the community presents numerous microfaciations and the relative importance of the various species changes with locality; the changes reflecting differences in the habitat inseparable from the broken nature of the country.

Transects made in typical hillside bush, northerly aspect, above the Weenen Nature Reserve placed the species in the following oder: *Euphorbia tirucalli, Pappea capensis, Cussonia spicata, Olea chrysophylla, Aloe spectabilis, Euclea lanceolata, Vitex rehmanni, Gymnosporia buxifolia Vepris lanceolata, Schotia brachypetala, Rhus dentata, Hippobromus alata* and *Acacia caffra.*

On the south side of Umhlumba Mountain there is an interesting patch of bush which is in many ways intermediate between Evergreen Forest and Semi-deciduous Bush. Umhlumba Mountain is really a promontory of the Tabamhlope Plateau and from its summit (5,345 ft.) its western, northern and southern sides slope down steeply into the Thornveld. The western and northern slopes are dry and typical semi-deciduous bush ascends a long way up them, but the southern faces are a mesocline. The patch of bush is located on this southern side near the summit, its upper margin being at about 5,200 ft.

The trees are small, averaging about 12 ft. They grow close together forming a continuous canopy. Under this canopy there are well developed layer societies of shrubs and herbs.

The important trees are *Gymnosporia buxifolia, G. angularis, G. peduncularis, G. albata, Olea chrysophylla, O. foveolata, Kiggelaria triphylla, Halleria lucida* and *Cussonia spicata. Grewia occidentalis Plectronia mundtiana, Dovyalis tristis, Euclea lanceolata, Heteromorpha triphylla, Halleria lucida and Cussonia spicata. Grewia occidentalis* occurs as a tree in the margins with *Rapanea melanophloeos* (in the upper margins). Consocies of *Buddleja salvifolia* and *Leucosidea sericea* occur around the bush margins. Around thê lower limits of the bush, the *Leucosidea* is particularly stunted, the plants forming small shrubs about two feet tall. This may be due to fire and to the fact that the *Leucosidea* is here growing at the extreme limit of its climatic range.

Mixed scrub *layer societies* are well developed and composed of *Cluytia* spp., *Clausena anisata, Plectronia ciliata* and *Carissa bispinosa. Streptocarpus gardeni* is very abundant on rocks and on the soil. *Hypoestes* spp. and *Chlorophytum elatum* are important in the ground vegetation. Ferns and orchids as epiphytes are common, but lianes are decidedly rare. *Rhoicissus cuneifolius* and *Dioscorea dregeana* were noticed.

2. Succulent Communities of the River Valleys.

Though the scope of this paper is limited to the present districts of Weenen and Estcourt, it is fitting that some mention should be made of the remarkable succulent communities which flourish along the lower reaches of the Tugela from just within the eastern boundaries of the Weenen District.

These communities are well developed in the Impafaan location formerly included in Weenen County, now m'Singa district, in the Mooi River Valley, particularly on its eastern side in the Umvoti District, in the Tugane Valley, tributary to the Mooi and further east in the valleys of the Impanza and Inadi, tributaries of the Mooi and the Tugela respectively.

Three main types of community are represented:—

(i) a *Euphorbia pseudocactus* Consocies,

(ii) a *Euphorbia tirucalli* Consociation (or Consocies?),

(iii) a *Euphorbia triangularis* Consociation.

(i) *The Euphorbia pseudocactus Consocies,* a succulent shrub 2–3 ft. tall, is most abundant in the valley bottoms, though it sometimes occurs on hillsides. At Keet's Drift on the Mooi, and in the Tugela Valley near Tugela Ferry, it is very dominant in an extensive community which occupies mainly the low lying land at the foot of the hills.

Aloe mudenensis, short stemmed or stemless, is often abundant in this community with occasional specimens of the tall *Aloe spectabilis* as well as a stunted form of *Euphorbia evansii.*

Relic patches of bush as well as occasional isolated specimens of *Boscia longipedicillata, Spirostachys africanus, Acacia litakunensis,* etc., indicate that the complete dominance of the shrubby succulents in this community is due to removal by the natives of the trees with which they were formerly associated. (See Section 3, this Chapter, Relic Communities.)

(ii) *The Euphorbia tirucalli Consociation (or Consocies?).*

Euphorbia tirucalli L. "The Rubber Euphorbia" dominates a peculiar and extensive community which is well developed along the lower reaches of the Tugela from the Otimati tributary of the Tugela, about 17 miles from the sea, to a considerable distance west of the Mooi-Tugela confluence.

In the Tugela Valley this community is best developed east of Tugela Ferry. In the Impafaan Location west of Tugela Ferry, the community is still extensive and dense, but here the trees are smaller and often shrubby. The community extends a little way into the Weenen District along the Tugela, the Mooi and the Bushman's rivers, but is poorly developed in this district.

It flourishes along the eastern side of the lower reaches of the Mooi and is conspicuous around Muden.

The community occupies the south bank of the Tugela and is almost invariably found on slopes with a N.E., N., or N.W. aspect, favouring particularly the N.E. It usually lies below 2,500 feet.

It should be noted that this community is not confined to the Tugela Valley. It occurs along other river valleys in Natal and in Zululand.

In Natal it can be seen in the Umvoti Valley and in the Umgeni and Umsindusi Valleys. Patches occur in the Umkomaas Valley and in Umpambinyoni Valley.

Euphorbia tirucalli, the dominant, is a spineless and almost leafless succulent tree, which in the Tugela Valley seldom exceeds 30 ft. in height. Within the community the trees are usually fairly uniform in size and grow close together forming a moderately dense canopy under which the light is considerably reduced.

Euphorbia tirucalli is typically very dominant and the stocking of this species may be as dense as 300 trees per acre, but is usually in the neighbourhood of 150 trees of 6 inches and greater diameter at breast height.

Associated with the Euphorbia are scattered trees and shrubs of *Acacia litakunensis, Boscia albitrunca, Cassine aethiopica, Cussonia spicata, Commiphora harveyi, C.* sp., *Dombeya cymosa, D. rotundifolia, Ehretia rigida, Erythrina caffra, Gymnosporia buxifolia, G. fasciculata, Mimusops concolor, Maerua rosmarinoides, Pappea capensis, Rhus* sp., *Rhamnus zeyheri, Schotia brachypetala, Spirostachys africanus, Vangueria infausta, Ximenia americana* and many other typical constituents of the semi-deciduous bush.

Creepers and lianes are usually very abundant and include *Acacia pennata, Cissus sandersonii, C. gracilis, Dalbergia obovata, Jasminum gerrardii, Rhoicissus capensis, R. digitata, R. rhomboidea* and many others.

Layer societies of shrubs and herbs are usually conspicious on the forest floor.

Calpurnia subdecandra plays an important part in the more open aspects. *Acalypha glabrata* and a *Croton* sp. are often conspicuous. Of the smaller plants the following are important: *Achyranthus robusta, Barleria elegans, B. obtusa, Hibiscus* spp., *Justicia flava, Orthosiphon wilmsii, Peristrophe natalensis* and *Priva adhaerans*. Many others occur. The grass *Panicum chusqueoides* is often common.

It is probable that over most of the area covered by this community the Euphorbia has attained dominance because of the peculiarities of the local climate, that the community forms part of the climax and should be regarded as a consociation.

On the other hand a suspicion that in some localities the community is developmental and represents a very persistent or sub-climax stage of the secondary succession is engendered by its patchy nature and the very abrupt tranisitions from patches of the Euphorbia dominated community to typical semi-deciduous bush.

(iii) *The Euphorbia triangularis Consociation.*

Euphorbia triangularis, a succulent tree which often attains a height of 30 ft. and is sometimes taller, occurs within the altitudinal limits of *Euphorbia tirucalli* as the dominant tree in patches of semi-deciduous bush, located on steep mesocline slopes usually with a SE., S., or SW. aspect. In the Tugane Valley near Muden and in the Impanza Valley it is dominant in quite extensive patches of brush which lie above the upper limits of the *Euphorbia tirucalli* consociation. Here probably because the rainfall is greater, its distribution is not limited by aspect.

Practically all of the species listed for the semi-deciduous bush association are associated with the dominant Euphorbia and often the proportion of other trees is much greater than in the *E. tirucalli* consociation.

3. Relic Communities.

The native cultivator seldom removes all of the trees from any area that is being prepared for cultivation. Occasional large trees are left to provide shade and some trees such as *Boscia longipedicellata* are for some reason never removed. Timber requirements too are restricted to certain species. This partial clearing and selective felling has resulted in the formation of relic communities. On areas of abandoned cultivation *Boscia longipedicellata* sometimes occurs in practically pure stands—in other relic communities *Vitex rehmanni* is the sole survivor or there may be a mixture of *Boscia longipedicellata, Vitex rehmanni* and *Vitex mooiensis*. Often the survivors are more numerous and *Cussonia spicata, Schotia brachypetala, Euclea lanceolata, Gymnosporia buxifolia* and *Aloe spectabilis* may be added to the list. *Euphorbia ingens* is usually conspicuous when these relic communities occupy hillsides. A very good example of the hillside type of relic community is to be seen below the road which decends a steep hillside with a north aspect above Weenen Township. Here the railway runs parallel to the road and below it. Between the road and the railway the vegetation is comparatively undisturbed. Below the railway there are Native kraals and the bush has been partially cleared. Here *Euphorbia ingens* is the most conspicuous tree with *Vitex Rehmanni, Euclea lanceolata, Acacia caffra* and other species.

The thinning of the bush resultant of felling or clearing allows the invasion of light demanding pioneer plants and grasses. *Acacia* spp. are always prominent in this secondary succession and, on old abandoned cultivation, often form a dense impenetrable scrub, very different from the attractive Acacia spp.—Open Woodland, which they give rise to when invading grassland. Clearing, cultivation and overgrazing often cause very severe erosion and large tracts are to be seen where the ground is eroded to the underlying shales and almost entirely denuded of vegetation. Occasional trees are left, often perched stilt-fashion on their exposed roots and there are usually patches of small shrubs and other plants, survivors from the original vegetation as well as pioneers. Typical representatives of the flora of these badly eroded areas are shrubs such as *Randia rudis, Lasiocorys capense, Asparagus* spp. etc., with *Sansevieria thyrsiflora, Bulbine narcissifolia, Justicia krausii, Peristrophe hensii, Gazania* and *Aster* spp., *Gomphrena decumbens* var. *genuina, Alternanthera repens, Bothriochloa insculpta, Aristida* spp. and *Tragus racemosus.*

4. The Principal Seral Community: The Acacia Species Associes.

Acacia species are always prominent in the seral stages leading to the climax. In the primary succession they invade open grassland, forming a typical Savanna community in which Acacia trees are dotted about in grassland. *Acacia karroo* and *Acacia arabica* are the usual pioneer species. *A. caffra* usually makes its appearance in the community somewhat later than the two first mentioned species. It is better suited to the less extreme atmospheric conditions induced by the growth of the pioneer species. *Acacia litakunensis* is important only in the lower Thornveld. Sometimes, particularly in the secondary succession on abandoned cultivation in marginal Thornveld, *Acacia woodii* may be numbered among the pioneer species, but it rarely assumes importance in this community.

The species exhibit different ranges of tolerance towards frost and the varying conditions of holard and it is largely due to the operation of these factors that one or other of the species usually tends to assume dominance in the various faciations presented by the associes. Bayer (1938) lays considerable stress on the interesting zonation which is sometimes apparent in this Acacia community. He points out that the community usually occupies valleys and that the plateaux between the valleys are usually covered by grassland in which *Acacia woodii* occurs. " On the edge of the plateaux the frequency of this species increases and finally near the rim of the valley a definite *Acacia woodii* tree veld is found. Below this however the *A. woodii* belt is followed by one of *A. karroo*. Lower down this is succeeded by zones, first of *A. caffra* and then of *A. arabica*. The *A. arabica* zone or belt occurs in the driest parts of the valley, usually about half way up the sides. Further down the valleys with improving moisture conditions the *A. caffra* and then the *A. karroo* zones recur." *A. karroo* forms the lowest zone, occuring also along the river banks, where it is associated with *A. woodii*. He remarks that establishment of the zonation may not always be easy, since on steeply sloping ground the zones are not invariably differentiated and also, the zonation which is due to slight climatic differences produced by topography is frequently disturbed by alternation of communities due to differences in soil conditions. It is probable that in areas where this zonation is marked, it is due to the average holard conditions on gentle slopes and to the position of zones kept free of frost by air drainage.

In this area where the hillsides are usually very steep and the water relations on the slopes are much complicated by the numerous dolerite intrusions, zonation is apparent only to a limited extent.

Acacia woodii penetrates very much further into the grassland than any other *Acacia* species. (Photograph 29.) It forms the *Acacia woodii consocies*, conspicuous in grassland on the Draycott Plain. (Photographs 27 and 30.) It has a thick corky bark and this plus the fact that it grows to a considerable size probably renders it less liable to injury by fire than the other *Acacia* spp., and explains its occurence in the grassland. (See p. 69.) *Acacia caffra* and *A. karroo* are more tolerant to frost and less tolerant to drought than *A. arabica*. (Photograph 36.) They are found both on the edge of the grassland and in the valley floors, often dominating a facies of the community along stream banks. *Acacia caffra* sometimes forms a consocies on the mesocline of steep valleys where the daily period of direct sunshine is much reduced. *Acacia litakunensis* (Photograph 37) is important in the Thornveld along the lower reaches of the Tugela and its tributaries. *Acacia robusta* is a coast-belt

species, which has reached the county by migration along the Tugela valley and has penetrated some distance along its tributaries. *Dichrostachys glomerata* has a distribution similar to *Acacia litakunensis.*

The processes described by Phillips (1934, 568–70) as *Succession-acceleration* and *Succession retardation* are well illustrated in this community.

Grass fires destroy Acacia seedlings. Thus fire tends to retard the development of the *Acacia* spp. associes and to maintain the grassland, even well within the climatic area occupied by the Semi-deciduous Bush association. There is considerable competition between the grasses of undisturbed veld and Acacia seedlings. On areas of abandoned cultivation the grass competition is temporarily eliminated together with the retarding effect of fire and on these areas, *Acacia* species are able to establish themselves and to attain dominance very rapidly.

Old ploughed fields are often marked by a thick growth of young trees while the surrounding undisturbed grassveld may be free of Acacia or studded with occasional trees. The same effect is obvious on over-grazed and eroded hillsides.

Development of the Associes.

(*a*) *Primary Areas.*

The *Acacia* species invade grassland producing, at first, a very open Savanna which gradually becomes thicker as the number of trees increases. The principal agents of seed dispersal are cattle and birds. When ripe, the pods of *A. arabica* and *A. litakunensis* fall to the ground and are much sought after by cattle during the winter months. The seeds which are not digested, germinate in the dung. In the case of *A. karroo,* the pods remain attached to the tree. They open when ripe and expose the seed. Many seeds fall to the ground and may be transported some distance by run-off water during heavy downpours, but a great number of seeds are eaten by weaver-birds and, presumably, those seeds which are not digested, germinate in the droppings of these birds. Grass competition and recurring fires kill the majority of the young seedlings so that the thickening process is slow. Established seedlings rapidly attain a size at which they are not damaged by fire and do not suffer in the competition for water with grasses. They grow into shapely small trees. At this stage the grasses suffer if the competition for water is severe. They suffer too in the competition for light.

In response to the change in habitat conditions, various undershrubs make their appearance and establish a layer society, around the bole in the shade of the Acacia tree, in which the grasses are partially or totally suppressed. The Malvaceae, Labiatae and Acanthaceae are well represented in these layer societies. *Sparmannia ricinocarpa, Malvastrum tricuspidatum, Sida rhombifolia, Abutilon sonneratianum, Pavonia meyeri, Hibiscus calycinus. Teucrium capense, Leucas martinicensis, Lasiocorys capensis, Plectranthus calycinus, Stachys caffra, S. aethiopica, Barleria obtusa. Justicia kraussii, Chaetacanthus gladulosus, Isoglossa grantii Peristrophe hensii, Hypoestes aristata, H. verticillaris* and *Dicliptera clinopodia* are typical representatives. As the density of the community increases, it begins to react strongly upon the factors which make up the habitat. Within the community from ground level to crown height, the humidity of

the air is increased and the temperature is lowered. The rate of evaporation is considerably lessened. Very important too, is the fact that the community acts as a fire break, completely eliminating or greatly reducing the occurrence and intensity of the fires which sweep the grassland.

At this stage species characteristic of the climax begin to make their appearance. Among the first are *Zizyphus mucronata, Gymnosporia buxifolia, Royena pallens, Euclea lanceolata, Rhus* spp. and *Cussonia spicata.* The majority of the seeds are brought in the droppings of fruit and seed-eating birds, which perch in the trees of the Acacia species associes. Largely because of the reduction of light intensity, the original constituents of the grasland between the trees give way to hygrophilous, shade-loving grasses such as *Sporobolus fimbriatus* var. *latifolius, Panicum* sp. etc. The constituent species of the climax community which develop in the shade and under the protection of the pioneer *Acacia* species eventually overtop and crowd out the original members of the Acacia spp. associes, all of which are intolerant of shade.

(*Acacia caffra* is most tolerant of all and persists longest in the developing association, but eventually it too is eliminated.)

Bews (1917) and Bayer (1938) state that in many parts a very important part is played in this succession by climbers which cover the original Acacia trees and rapidly produce dense shade. This, however, does not occur to any marked extent within Weenen County, where climbers are not conspicuous.

The following species occur within the Thornveld areas and are listed for reference: *Asparagus* spp., *Bowiea volubilis, Dioscorea* spp. (O. W. Nos. 533 and 1,200), *Dioscorea dregeana, D. crinata, Commicarpus pentandrus, Clematis brachiata, Vigna triloba, Dalbergia obovata, Pelargonium lateripes, Helinus integrifolius, Rhoicissus cuneifolius, R. digitata, Cissus woodii, Jasminum multipartitum, Ceropegia setifera, C. carnosa, Sarcostemma viminale, Ipomoea* spp., *Coccinea* sp. and *Senecio deltoideus.*

(*b*) *Secondary Areas.*

The establishment of the *Acacia species associes* on Secondary Areas usually proceeds very much more rapidly than in undisturbed veld. The retarding influence of fire is absent and because grasses have been removed or greatly weakened by denudation, cultivation, overgrazing and trampling or erosion, great numbers of seedlings are able to establish themselves very rapidly. The stocking on secondary areas is usually very high, sometimes between 2,000–3,000 stems per acre. When the community is as dense as this, the trees are all of the same size so that there is little competition for light, but the competition for water is severe and the reaction on the edaphic factors is very detrimental. The holard is reduced so much, that the grasses and other ground vegetation are eliminated. This baring of the ground surface encourages the processes of soil denudation and desiccation and as has been pointed out by Bayer (1933), may initiate a period of severe erosion. Thus the succession towards the climax is temporarily halted.

5. The Acacia woodii Consocies.

Solitary specimens or groups of two or three trees of the large and very beautiful n'Kamba tree, *Acacia woodii,* occur scattered throughout the grassland of the Draycott Plain. In places, where some measure of

protection has been afforded *Acacia woodii* occurs in greater numbers forming small patches of parkland, the *Acacia woodii consocies.*

Along the Little Blaauwkrantz River near Moorleigh, there are fairly extensive and quite dense patches of this Acacia and numerous large trees grow in the old dongas below Draycott Hill. (Photographs 27, 29 and 30.)

As has already been pointed out, *A. woodii* is by no means confined to the edge of the Thornveld and to the grassland of the Draycott Plain, it occurs throughout the Thornveld, especially in the valley bottoms and on the river banks. It is unique in its ability to invade the open grassland, into which it penetrates very much further than any of the other *Acacia* species. This is due to its ability to survive the frequent fires which are a feature of the grassland areas and which retard the colonisation of the Draycott plain by other trees or shrubs less tolerant of fire. In the patches of *Acacia woodii* woodland on the Draycott plain there is apparently very little tendency for the succession to advance beyond the existing stage, but an interesting example of the development of this community in the Thornveld can be observed on the farm Schurfdepoort on the Tugela below Colenso.

Here an area, formerly cleared by cultivation, is covered by a colony of tall spindly *Acacia woodii* trees. Below the trees there is a good stand of grass, a secondary community consisting of *Sporobolus fimbriatus, Themeda triandra, Aristida* spp., *Hyparrhenia hirta, Bothriochloa insculpta, Cymbopogon validus* and *Cynodon dactylon.*

During recent years this grass has been very heavily grazed and, because of this, fire has been kept out. Consequently the grass is being invaded by a dense short scrub of *Acacia karroo,* which is beginning to form an understory to the *Acacia woodii* consocies.

CHAPTER VIII.

GRASSLAND.

1. Literature.

Bews (1918, 110) distinguishes two main types viz. *Eastern Grassland* proper and *Mountain Tussock Grassveld.* Eastern Grassland he subdivides into *Highveld* and *Lowveld* types, the Highveld type occurring on the rising slopes and the Lowveld type in river valleys. He states that despite the considerable climatic and edaphic differences between the two habitats, there is not the difference in the composition of the grassland that could be expected. He stresses the dominance of *Themeda triandra* throughout the Eastern Grassland. " Where the soil is sufficiently uniform and of sufficient depth, *A. imberbis* alone is dominant. Other grasses and associated plants occur very scarcely mixed with it " (Bews, 1917) and " over by far the largest areas of Eastern grassland *Anthistiria imberbis* (insinde) is the dominant species " (Bews 1918, 116). He regards Themeda grassland as a stable climax stage (1918, 116) but points out that in many parts grassland occupies " what are natural forest climatic habitats " (1918, 127) and that if fire is kept out, such areas would develop to forest.

His *Mountain Tussock Grassveld* " occurs on the slopes of the Drakensberg, at altitudes of 4,000 to 8,000 ft. . . The grasses grow in densely caespitose tufts as a rule, and they are rather xerophytic forms with setaceous or subsetaceous or firmly folded or convolute leaves. The old leaf base persists, forming dense stools or tussocks, which collect the usually red soil, and stand up a few inches above the rest of the ground. There are very narrow bare spaces between the tussocks " (1918; 138).

He lists the most characteristic mountain veld species,, *Microchloa caffra, M. altera* var. *nelsoni, Harpechloa falx, Festuca caprina, F. costata, F. longipes, F. scabra, Poa binata, Koeleria cristata, Anthoxanthum ecklonii, Avenastrum turgidulum* etc. He notes that the ordinary Eastern grassland species also occur and become increasingly prominent as the season advances, tending " to make the Tussock veld lose its distinctive character and to appear more like the normal type of Eastern Grassveld." It should be noted that this Mountain Tussock grassveld is quite distinct from the Alpine grassland already described in this paper. In reality, Bews' description is based on the accentuation by surface erosion on steep hillsides, of the natural bunch life form characteristic of practically all of the Highveld grasses in Natal and in other parts of the Union.

Adamson (1938) states that in Natal, grassland is the dominant vegetation over 4,000 feet and may descend to 3,000 feet. He distinguishes six types: (1) Highveld grassland, (2) dry grassland, (3) moist grassland, (4) mountain grassveld (Tussock grassland), (5) Protea grassland, and (6) Riverside and Valley communities. His mountain grassveld (Tussock grassland) is described as the type found on the higher parts of the mountains from 5,000 ft. upwards. " The dominant grasses in this type are low growing and tend to form dense tussocks of rather small size.

The tussocks may be close together so that the appearance of a uniform sward is given, or may be spaced out to give an uneven surface." Adamson lists no species.

Pentz (1938; 1940) working within the Reclamation area situated between the Mooi and Tugela Rivers, distinguishes four main vegetation types: (1) Thorn or Bush Veld, (2) Tall Grassveld, (3) Highland Sour Veld, and (4) Mountain Veld. No species are listed for these veld types.

Scott and Pentz (1938) give short lists of grasses found within these vegetation types and delimit the areas by altitude.

1. Berg or Mountain Veld: Above 6,000 feet.
2. Highland Sourveld: 4,500–6,000 feet.
3. Tall Grass Veld: 3,500–4,500 feet.
4. Thorn or Bush Veld: Below 3,500 feet.

Staples (1930; 6) in " A second Report on certain Veld Burning and Grazing Experiments " describes in an exact and quantitative manner, the composition and structure of natural grassland at Cedara and its response to various burning, mowing and resting treatments.

He showed that the dominance of *Themeda triandra* was maintained by periodical burning at certain seasons and concludes that " *Themeda triandra* is only a stage in the succession. The climatic and soil climax vegetation is undoubtedly forest."

In other words the Cedara grassland is a sub-climax maintained by fire. This is true not only for Cedara, but for most grassland in South Africa.

Phillips (1935; 57) believes it is extremely doubtful whether in the Union more than rather local areas in the colder regions of the Free State and Southern Transvaal e.g. the Standerton area—are truly climax grassland.

This opinion is based on the presence of abundant or relic woody elements and on the development to scrub if the grazing is either too light or too heavy.

Weaver and Clements (1929; 79) state that " Grassland areas are produced the world over as a result of burning and grazing combined, and they persist just as long as burning recurs."

Cockayne (1919) in New Zealand and many other workers in Africa and other parts, substantiate these observations and stress the retarding influence of fire on the development of vegetation towards climax. (Busse 1908, Jaeger 1911, Obst 1923, Bews 1912 and 1927, Galpin 1926, Henkel 1928, Bayer 1938, Phillips 1926, 1930, 1931.b, 1935, 1935.b, pt. 11, Clements 1934 and many others.)

2. Grassland in the Weenen County.

Excluding the Alpine Region already described, the topographical regions covered by grassland are the Little Berg Plateau, the Tabamhlope Plateau and the Draycott Plain.

All of this grassland is subjected to periodical fires and must be regarded as a sub-climax caused and maintained by fire. Controlled

burning and protection experiments (Sect. 7, page 80) show that periodic burning maintains the typical "Undisturbed Veld" while protection induces considerable changes in composition and structure leading to the eventual suppression of the grass and its replacement by forbs and woody shrubs seral to bush and forest.

All the available evidence leads to the conclusion that the true climax vegetation on the Little Berg and Tabamhlope Plateau is Evergreen Mountain Forest, and that the Draycott Plain is an ecotonal region which lies between this climax formation and the semi-deciduous bush formation reaching up the dry river valleys.

[Pentz (1938 and 1940) distinguishes the Ecotonal grassland of the Draycott Plain, which he calls "Tall Grass Veld", from the grassveld of the Tabamhlope Plateau, his "Highland Sour Veld". This distinction is based on the presence in the ecotonal region of *Hyparrhenia hirta* a species which is important there in the latter stages of the secondary succession and is indicative of remote disturbance (Glover 1937).]

3. Composition of the Undisturbed Veld (Sub-climax Grassland).

The term *undisturbed veld* is applied to the highest expression of the grassland succession under the current prevailing conditions, which include moderate grazing and periodic burning, but exclude biotic or other causes for the initiation of secondary seres, such as trampling, overgrazing, ploughing etc.

The characteristic grasses of undisturbed veld are: *Andropogon filifolius, Harpechloa falx, Andropogon amplectens, Heteropogon contortus, Alloteropsis semialata, Koeleria cristata, Brachiaria serrata, Microchloa caffra, Digitaria tricholaenoides, Monocymbium ceresiiforme, Digitaria monodactyla, Panicum natalense, Elyonurus argenteus, Setaria nigrirostris, Eragrostis capensis, Setaria flabellata, Eragrostis chalcantha, Trachypogon capensis, Festuca scabra, Themeda triandra* and *Tristachya hispida.*

It is the association of the characteristic grasses together with the exclusion of pioneer species from the community, rather than the dominance of individual species or groups of species, that distinguishes Undisturbed Veld. The relative importance of the individual species varies greatly. The important species are all usually present, but the grouping of the dominants changes with minor variations in the habitat. Bigger changes are evidenced by the inclusion of new species or the exclusion of some of those listed as characteristic.

In the Ecotonal Grassland of the Draycott Plain and Thornveld, *Andropogon filifolius, Koeleria cristata,* and *Festuca scabra* are not found while *Alloteropsis semialata, Digitaria tricholaenoides, Harpechloa falx, Monocymbium ceresiiforme, Panicum natalense and Trachypogon capensis* are rare or occasional species. On the other hand *Hyparrhenia hirta* is a very important addition in this ecotonal grassland where it vies with *Tristachya hispida* and *Themeda triandra* for dominance.

At the other extreme on the Little Berg in the ecotone seperating the sub-climax "undisturbed veld" grassland from the Alpine formation, *Harpechloa falx, Microchloa caffra, Koeleria cristata, Festuca* spp., *Poa* spp., *Danthonia* spp. etc., become increasingly important at the expense of *Themeda triandra, Tristachya hispida* and *Trachypogon capensis* which tend to disappear.

ESTCOURT PASTURE STATION.

UNDISTURBED VELD

Block.	Tristachya hispida.	Hyparrhenia hirta.	Themeda triandra	Sporobolus pyramidalis.	Eragrostis spp.	Setaria nigrirostris.	Heteropogon contortus.	Eragrostis capensis.	Elyonurus argenteus.	Aristida bipartita.	Brachiaria serrata.	Microchloa caffra.	Digitaria monodactyla.	Eragrostis chalcantha.	Setaria flabellata.	Andropogon amplectens.	Alloteropsis semialata.	Cyperaceae.	Dicotyledonae.	Total percentage of basal area covered.
1....................	7·5	8·5	4·6	2·3	0·2	0·7	0·2	—	—	0·3	—	—	—	0·2	—	—	—	—	—	24·5
2....................	8·2	9·2	5·8	2·8	0·6	1·8	0·2	—	0·2	0·4	—	—	—	0·4	—	—	—	0·6	0·4	30·6
3....................	10·0	10·0	6·4	3·0	0·6	0·8	1·0	—	0·6	—	0·2	—	—	—	—	0·2	—	—	0·2	33·0
4....................	8·5	6·2	4·0	0·3	1·7	0·2	—	0·2	—	0·3	0·2	0·7	—	—	—	—	—	—	0·3	22·6
5....................	6·3	4·3	3·0	3·0	—	0·5	0·7	0·3	0·2	0·2	—	0·2	0·3	—	0·5	—	—	0·2	0·5	20·0
6....................	8·0	6·7	3·2	3·0	—	0·8	—	—	0·3	0·2	0·5	—	0·5	—	—	—	0·2	—	1·0	24·4
7....................	14·4	6·6	3·8	—	1·8	1·6	0·4	0·6	0·4	—	0·6	0·2	—	—	—	—	—	—	1·4	31·8
8....................	8·0	8·6	6·0	3·6	—	—	—	0·6	—	0·4	—	—	—	—	—	—	—	0·2	0·2	27·6
9....................	9·5	7·2	3·3	—	2·5	0·7	—	0·5	—	—	—	—	—	—	—	—	—	0·3	1·2	25·2
Average percentage of basal area covered	8·9	7·5	5·7	2·6	1·1	1·0	0·4	0·3	0·3	0·3	0·2	0·2	0·1	0·1	0·1	·03	·03	0·2	0·7	29·7

ESTCOURT PASTURE STATION.

UNDISTURBED VELD.

Block.	Themeda triandra.	Heteropogon contortus.	Tristachya hispida.	Digitaria monodactyla.	Eragrostis chalcantha.	Hyparrhenia hirta.	Eragrostis capensis.	Setaria flabellata.	Microchloa caffra.	Eragrostis spp.	Digitaria tricholaenoides.	Trachypogon capensis.	Brachiaria serrata.	Sporobolus pyramidalis.	Elyonurus argenteus.	Monocymbium ceresiiforme.	Setaria nigrirostris.	Alloteropsis semialata.	Andropogon amplectens.	Cyperaceae.	Dicotyledonae.	Total percentage of basal area covered.
1..........	8·0	3·5	3·5	3·5	3·5	3·0	2·0	1·0	1·5	0·5	—	0·5	2·0	—	—	—	—	0·5	—	0·5	0·5	34·0
2..........	7·5	6·0	3·5	1·5	3·0	1·5	2·0	3·5	1·5	0·5	0·5	1·5	—	0·5	0·5	—	—	—	0·5	0·5	—	34·6
3..........	6·0	9·0	4·0	2·0	3·0	3·5	1·5	—	1·0	1·0	3·0	—	—	—	0·5	—	—	—	—	—	—	34·5
4..........	2·0	9·5	4·5	4·0	3·5	3·0	1·0	—	4·0	—	4·0	3·0	—	2·0	0·5	2·0	—	—	—	0·5	—	43·5
5..........	10·5	1·2	6·5	7·0	2·5	1·5	1·0	—	1·0	1·5	—	—	—	2·0	—	—	—	—	—	—	0·5	35·2
6..........	14·0	5·5	5·2	5·0	2·0	2·5	2·0	3·5	—	0·5	—	—	2·0	—	1·0	—	—	—	—	—	—	43·2
7..........	10·0	6·0	7·0	4·0	1·2	0·5	1·2	1·0	1·0	0·5	—	—	0·5	—	—	—	—	—	—	—	—	32·9
8..........	11·0	4·0	4·5	10·0	1·0	3·5	2·5	1·0	—	4·5	—	0·5	—	—	1·0	—	0·5	—	0·5	0·5	0·5	45·5
9..........	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Average percentage of basal area covered	8·6	5·6	4·8	4·6	2·5	2·4	1·7	1·3	1·3	1·1	0·9	0·7	0·6	0·6	0·4	0·3	0·1	0·1	0·1	0·3	0·2	38·2

TABAMHLOPE PASTURE RESEARCH STATION.

UNDISTURBED VELD.

Block.	Themeda triandra.	Andropogon filifolius.	Digitaria tricholaenoides.	Tristachya hispida.	Trachypogon capensis.	Harpechloa falx.	Eragrostis chalcantha.	Monocymbium ceresiiforme.	Alloteropsis semialata.	Eragrostis capensis.	Elyonurus argenteus.	Brachiaria serrata.	Andropogon amplectens.	Eragrostis spp.	Cyperaceae.	Dicotyledonae.	Total percentage of basal area covered.
1	25	7	—	2	3	1	1	—	2	2	—	—	—	—	2	1	46
2	16	5	4	11	4	—	—	1	—	—	—	—	—	—	—	—	41
3	18	3	14	3	4	1	2	—	1	1	—	—	—	1	—	—	48
4	11	5	11	6	—	2	1	2	—	—	—	—	—	—	—	2	40
5	9	3	7	4	6	3	1	4	—	—	—	—	—	—	—	1	38
6	9	14	4	5	1	7	6	5	—	—	2	—	—	—	4	—	57
7	4	2	—	1	1	5	3	—	1	4	1	—	—	—	1	1	24
8	10	12	9	4	2	1	1	—	3	—	2	—	1	1	2	1	48
9	7	9	6	4	8	—	5	—	8	2	—	1	—	—	—	—	42
10	8	4	3	7	9	7	1	4	9	—	—	—	—	—	—	1	44
Average percentage of basal area covered	11·7	6·4	5·8	4·7	3·8	2·7	2·1	1·6	0·7	0·9	0·5	0·1	0·1	0·1	1·4	0·7	42·8

The attached percentage area analyses of blocks of typical Undisturbed Veld on the Tabamhlope and Estcourt Pasture Stations illustrate far better than any written description the composition and nature of this type of grassland. The Tabamhlope Research Station is representative of the Tabamhlope Plateau and the greater part of the Little Berg Plateau, an area where as has already been stated, the climax vegetation is probably forest. Interesting points well illustrated by the analysis figures are the importance and even distribution of the grasses *Trachypogon capensis* and *Andropogon filifolius* and the extreme rarity in undisturbed veld of pioneer grass species. At Estcourt on the Draycott Plain, the presence of such typically pioneer species as *Eragrostis plana, Sporobolus pyramidalis* and *Aristida bipartita* indicates that in the past the grassland must have been subjected to very heavy grazing. This may account too, for the abundance of *Hyparrhenia hirta* in veld which is apparently undisturbed. *Hyparrhenia hirta* at Frankenwald in the Transvaal Highveld is an indicator of remote disturbance (Glover 1937), that is, it becomes important at a late stage in the secondary succession. This applies in the grassland on the Draycott Plain, where it plays an important part in the secondary succession.

There is abundant evidence in the shape of numerous old stone kraals to show that the Draycott Plain formerly carried a very heavy native population (Ch. 11 pp. 5—7). It must therefore have been subjected to extensive and long continued disturbance by cultivation and grazing.

It should be recognised however, that because of its deep root system and late growing and flowering season, *Hyparrhenia hirta* is well fitted to play an important part in grassland, dominated by *Themeda triandra* and *Tristachya hispida*, which are both early flowering grasses with comparatively shallow root systems. It is dominant in undisturbed veld, only on deep soils usually over dolerite, where it is enabled by its deep root system to avoid competition for water. On shallow soils over impervious shale, it never approaches dominance and is often entirely absent. The transition from a soil type in which *Hyparrhenia hirta* is one of the dominant grasses to a type in which it is almost absent, is often extremely sudden and usually marks the limit of a mass of intrusive dolerite.

4. Character of the Undisturbed Veld.

Practically all of the constituent species are of the bunchgrass life form, the only exceptions being those species which exhibit rhizomes or stolons and tend to form sods—*Digitaria tricholaenoides, Setaria nigrirostris, Setaria flabellata* and *Andropogon appendiculatus*. The size and appearance of the bunches or tussocks and the amount of bare ground between them varies immensely. They may be small and close together, giving the appearance of an even sward, or the individual bunches may be large, widely spaced and often slightly elevated. This latter condition is very noticeable on hillsides where the bare ground between the tussocks has been eroded by run-off water during rains (usually spring rains falling on veld burned in autumn or during winter). This is the type of veld which has given rise to the descriptions of Tussock Grassland and Montane Grassland already referred to.

5. Associated Forbs.

Growing intermingled with the grasses are numerous other plants belonging to the Monocotyledonae and the Dicotyledonae. These forbs are in active competition with the dominant grasses for water and to

some extent for light. Under the existing conditions of burning and grazing the grasses have the advantage and the forbs do not become dominant. Individual plants are often scattered far and wide but in sites where there is sufficient water for both grasses and associated forbs, societies are formed. With few exceptions the associated forbs are perennials with underground storage organs. The monocotyledonous plants possessing bulbs, corms, tubers etc., shoot just before or just after the first rains and complete their flowering and fruiting very rapidly. Many of the dicotyledons have perennial woody rootstocks from which fresh shoots are made each spring, others e.g. many of the Asclepiadaceae, possess large underground tubers. The great majority flower during the first half of the growing season and many continue to flower during the latter half. The tendency is for the grassland to become taller as the season advances, because the tall grasses, *Trachypogon capensis* and *Hyparrhenia hirta* flower late. Hence the late summer and autumn societies are composed chiefly of tall, late-flowering composites able to compete with the taller grasses for light.

These associated plants are very numerous and only the most important can be indicated here. A full list is contained in Chapter XII.

Monocotyledonae.

The Cyperaceae is represented by *Cyperus compactus, C. semitrifidus, Kyllinga erecta, Fimbristylis monostachya, Bulbostylis scleropus* and *B. trichobasis*. The Xyridaceae by *Xyris gerrardii* in moist sites. The Commelinaceae by *Commelina africana* and *Cyanotis nodiflora*. The Liliaceae has numerous representatives belonging to the genera *Wurmbea, Bulbine, Anthericum, Eriospermum, Kniphofia, Aloe, Leptaloe, Tulbaghia, Albuca, Urginea, Dipcadi, Scilla, Eucomis* and *Ornithogalum*. The Amaryllidaceae is represented by members of the genera *Nerine, Brunsvigia, Anoiganthus* (in moist sites), *Apodolirion* and *Crinum*. The Iridaceae is another important family represented by numerous plants belonging to the genera *Moraea, Aristea, Hesperantha, Dierama, Tritonia, Gladiolus* and *Watsonia*. The Orchidaceae is represented by members of the genera *Habenaria, Brachycorythis, Satyrium, Disa, Disperis* and *Eulophia*.

Dicotyledonae.

The Santalaceae is represented by several species of *Thesium;* the Polygonaceae by species of *Rumex*, usually indicators of overgrazing or disturbance. The Phytolaccaceae by *Psammotropha myriantha;* the Caryophyllaceae by members of the genera *Silene* and *Dianthus;* the Ranunculaceae by *Ranunculus pubescens;* the Cruciferae by species of *Heliophila* and *Brassica;* the Crassulaceae by *Crasula* spp.; the Rosaceae by *Alchemilla woodii* in moist sites. The Leguminosae is particularly well represented and important. The genera *Cassia, Hoffmanseggia, Lotononis, Argyrolobium, Medicago, Trifolium, Indigofera, Tephrosia, Lessertia, Zornia, Erythrina, Rhynchosia, Eriosema* are all represented. *Eriosema kraussii* is very abundant in undisturbed veld on the Tabamhlope Station. The Geraniaceae is represented by *G. ornithopodium* and *G. pulchrum* in moist sites, *Monsonia* spp. in Thornveld grassland and several *Pelargonium* spp.; the Oxalidaceae by *Oxalis* spp.; the Polygalaceae by *Polygala hottentotta* and *P. gracilenta*. The Euphorbiaceae by *Acalypha* spp., *Cluytia monticola, Euphorbia striata, E. truncata* and *E. clavarioides;* the Anacardiaceae by *Rhus discolor*, a small shrub; the Vitaceae

by *Cissus dolichopus;* the Malvaceae by *Hibiscus* spp.; the Sterculiaceae by *Hermannia* spp.; the Guttiferae by *Hypericum* spp.; the Thymeliaceae by *Gnidia* spp.; the Umbelliferae by *Alepidea amatymbica* and *Hydrocotyle asiatica;* the Oleaceae by *Mendora africana;* the Gentianaceae by *Sebaea* spp. and *Chironia* spp.; the Asclepiadaceae, another important and well represented family, by members of the genera *Raphionacme, Xysmalobium, Schizoglossum, Pachycarpus, Asclepias* and *Pergularia;* the Convolvulaceae by *Ipomoea* spp.; the Borraginaceae by *Cynoglossum* spp.; the Labiatae by *Ajuga ophrydis, Leonotis* spp. and *Becium obovatum;* the Scrophulariaceae by *Nemesia* spp., *Diclis reptans, Hebenstreitia* spp., *Selago monticola, Walafrida densiflora, Melasma* spp., *Graderia scabra, Sopubia cana, Buechnera dura, Cycnium racemosum* and *Striga thunbergii;* the Acanthaceae by *Chaetacanthus burchellii;* the Rubiaceae by *Oldenlandia amatymbica* and *O. natalensis, Pentanisia prunelloides, Pachystigma chamaedendrum* and *Anthospermum* spp.; the Dipsaceae by *Cephalaria* spp. and *Scabiosa* spp.; the Cucurbitaceae by *Cucumis africanus;* the Campanulaceae by *Wahlenbergia* spp., *Cyphia elata* and *Lobelia* spp.; the Compositae by a great number of species belonging to the genera *Vernonia, Aster, Erigeron, Nidorella, Conyza, Gnaphalium, Helichrysum, Athrixia, Callilepis, Athanasia, Cernia, Schistostephium, Cineraria, Senecio, Ursinia, Haplocarpha, Gazania, Berkheya, Dicoma, Gerbera, Sonchus, Lactuca* and *Crepis.*

6. Phenology of the Undisturbed Veld.

In the winter the grasses of the undisturbed veld are dry and dormant. The first frosts kill their exposed foliage and ripen the greens and brown of late summer and autumn to rich shades of purple brown and gold, which combine to produce a landscape that is particularly lovely in the soft lights of winter afternoons. During the dry winter season these rich tones are bleached a uniform light brown colour and in August the veld by comparison with its former glory is dull and monotonous. The dry, dust-raising winds prevalent at this season of the year do little to improve this impression of drabness. With the increase in temperature there is a certain amount of shooting and flowering. Many veld plants all characterised by large underground storage organs, flower regularly before the first rains.

The first members of this pre-rain flora are *Scilla* spp., *Hypoxis argentea, Albuca pachyclamys, Gerbera kraussii, Gazania* spp. and *Becium obovatum.* But many other plants, some of which are listed below, have been observed flowering before the rains have started the grasses growing. The following are conspicuous: *Ornithogalum* spp., *Moraea* spp., *Cyrtanthus contractus, Tritonia lineata, Hermannia depressa, Polygala hottentotta, Pentanisia prunelloides, Ipomoea crassipes, Euphorbia striata, Cluytia monticola, Asclepias multicaulis, Raphionacme galpinii, Aster bakerianus* and *Senecio* spp. Many of the listed plants continue flowering for a long time, some right through the season. The grasses remain dormant and unless the winter has been exceptionally wet, there is no greening of the veld until the first rains fall. Rain, expected from the middle of September, brings an immediate response. The veld begins to green very rapidly. Burned areas are quite green within a few days of the first good soaking rain. In unburned veld the green is masked for some time by the brown dead foliage. In unburned veld

covered by a tall top hamper shooting is considerably delayed. Flowering begins within a few weeks of shooting. First of all, such grasses as *Festuca scabra, Koeleria cristata, Elyonurus argenteus* and *Eragrostis chalcantha* and then following immediately *Harpechloa falx, Themeda triandra, Tristachya hispida, Brachiaria serrata, Setaria flabellata, Setaria nigrirostris, Eragrostis capensis, Andropogon filifolius, Heteropogon contortus, Panicum natalense* and *Andropogon amplectens*. An attempt has been made in this list to place the species in order of flowering, but the differences are not marked as all these grasses may be observed in flower at the same time and often with inflorescences in all stages, from unopened spikelets to formed seeds.

Flowering continues for some time and ripe seed can be reaped over a considerable period, but usually most of the seed ripens from the end of November to the middle of December, though sometimes it is considerably later. In February only dry empty panicles remain to show that the spring grasses have flowered and set seed. Societies of forbs are conspicuous throughout this flowering period. Towards the middle of February a second flowering season begins—much fewer species contribute to this flush, but they are all important, namely, *Monocymbium ceresiiforme, Trachypogon capensis* and in the ecotonal veld, *Hyparrhenia hirta*. The flowering season of *Hyparrhenia hirta* particularly, is a very extended one and much seed of this species ripens after the first frosts.

The Correlation with the Rainfall.

The times of the resumption of growth and of flowering are largely controlled by the rainfall and particularly by the amount of rain during winter and the time and amount of the spring rains. This can best be illustrated by reference to particular seasons.

The following dates are of interest:—

HYPARRHENIA HIRTA IN EXPERIMENT 19, ESTCOURT.

	1937–38.	1938–39.	1939–40.
Culms begin to shoot	5.2.38	2.2.39	31.1.40
Full flower (flowers and seed)	10.3.38	22.3.39	15.4.40
Ripe seed, no flowers	14.4.38	19.5.39	5.5.40

Societies of flowering plants are not conspicuous during the latter half of the growing season, but many of the plants which flowered in spring continue to flourish and various tall composites such as *Senecio serra* begin to flower.

7. The Reaction to Burning.

It has been found that burning at different times has a marked effect on the times of flowering and shooting. This is well illustrated by observations made by the writer at Tabamhlope in an experiment laid down by Mr. J. D. Scott. In this experiment randomised plots are subjected to burning and mowing treatments at different times of the year.

TABAMHLOPE RESEARCH STATION.

Date.	Burn at commencement of Winter.	Burn in Spring before first rains.	Burn in Spring after first rains.	Complete protection.
18.10.38.....	*Koeleria, Festuca, Panicum, Harpechloa, Themeda, Tristachya, Alloteropsis.* All flowering.	Ditto. All flowering.	All grasses shooting. No flowering.	Very little shooting. No flowering.
8.10.39......	Ditto. All flowering.	Ditto. All flowering.	All grasses shooting. Leaves 4–6″. No flowering.	Very little shooting. No flowering.

The plots which are burned before winter are adversely affected by the long period of exposure to frost and insolation to which they are subjected. This is reflected in their appearance at the time of regrowth. Flowering begins very early but leaf growth is much less than in plots burned later. Drought at the begining of the season has a much more harmful effect on plots which have been burned and which have commenced to grow vigorously than on unburned veld. Burning has a very marked effect on the composition and structure of the veld. Staples (1930), working in similar grassland at Cedara found that in order to maintain or encourage the dominance of *Themeda triandra*, it was necessary to burn during the winter months when the vegetation was dormant. He found that burning during the summer months discouraged *Themeda triandra.*

Quadrat results given below show quite conclusively that *Themeda triandra* is maintained and encouraged by winter burns in veld protected from grazing and burning.

The effect of winter burning when the grasses are dormant, compared with the effect of complete protection on undisturbed veld.

At Estcourt and at Tabamhlope, blocks of veld have been set aside protected by fences and fire breaks from burning and grazing. At Estcourt the protection blocks were fenced at the end of 1936 and since then the veld within them, except the firebreaks has been afforded complete protection from burning and grazing. The fire breaks are broad and are located inside the fences. They are burned every year as soon as the grasses are dry and dormant, but are protected by the fences from grazing. A series of permanent chart quadrats put down in selected sites within these blocks were first charted in June 1938. These quadrats were recharted in November 1941.

At Tabamhlope, protection blocks were fenced during March 1939. Quadrats were charted then and again during December 1941. Quadrats Nos. 10 and 16 (Photograph 33) at Estcourt were located in exactly similar veld and only a few yards from each other. No 10 has been burned

each year during early winter and protected from grazing since the beginning of 1937. No. 16 has been afforded protection from burning and grazing since the beginning of 1937. In the same way quadrats Nos. 22 and 19 at Estcourt were located in similar veld and were only a few yards apart. No. 22 has been burned each winter at the same time as No. 10 for the same period. No. 19 has been protected from burning and grazing for the same period.

Quadrat No. 28 at Tabamhlope has been protected from grazing and burning since March 1939.

	Winter Burn.		Complete Protection.	
	Quadrat No. 10.		Quadrat No. 16.	
	10.6.38.	7.11.41.	12.7.38.	7.11.41.
	%	%	%	%
Hyparrhenia hirta	10·0	7·0	6·8	13·1
Themeda triandra	10·0	10·6	14·5	0·5
Tristachya hispida	1·3	0·9	2·6	1·9
Aristida bipartita	2·8	nil.	2·2	nil.
Eragrostis plana and *Sporobolus pyramidalis*	0·4	0·3	1·9	nil.
Total (Basal) Area covered	24·5	18·8	28·3	15·5

	Winter Burn.		Complete Protection.	
	Quadrat No. 22.		Quadrat No. 19.	
	10.6.38.	11.11.41.	13.7.38.	7.11.41.
	%	%	%	%
Themeda triandra	19·9	15·3	10·9	4·4
Heteropogon contortus	—	—	10·2	1·5
Microchloa caffra	—	—	7·3	nil.
Tristachya hispida	5·8	3·1	7·8	9·1
Elyonurus argenteus	0·8	—	0·8	3·8
Brachiaria serrata	—	—	0·8	0·3
Eragrostis capensis	—	—	0·1	0·1
Eragrostis chalcantha	—	—	0·4	0·3
Trachypogon capensis	—	—	0·3	0·4
Setaria nigrirostris	0·8	0·4	—	—
Hyparrhenia hirta	0·3	0·3	—	—
Eragrostis sp.	0·6	0·4	—	—
Cyperaceae	0·5	2·5	3·0	0·5
Dicotyledonae	—	—	—	—
	25·7	22·0	41·6	20·3

	Complete Protection.	
	Quadrat No. 28.	
	15.3.39.	17.12.41.
	%	%
Tristachya hispida	6·6	7·8
Themeda triandra	5·5	1·8
Eragrostis chalcantha	4·6	0·1
Andropogon filifolius	4·4	7·8
Digitaria tricholaenoides	3·9	1·0
Trachypogon capensis	3·1	1·9
Eragrostis capensis	0·5	nil.
Harpechloa falx	0·5	1·0
Alloteropsis semialata	0·5	0·5
Monocymbium ceresiiforme	0·4	nil.
Panicum natalense	nil.	0·2
	30·0	22·1

Conclusion.

The charts show quite definitely that *Themeda triandra* has remained dominant in quadrats burned during the winter and protected from grazing, while in the quadrats which are protected from both grazing and burning it rapidly disappears. The same effect can often be noticed in railway firebreak enclosures.

Quadrat results and field observation indicate that:—

(1) Grasses which disappear in veld protected from both grazing and burning are: *Themeda triandra, Heteropogon contortus, Microchloa caffra, Eragrostis chalcantha* and *Digitaria tricholaenoides*.

(2) Grasses which persist when afforded complete protection are: *Trachypogon capensis, Tristachya hispida, Harpechloa falx, Alloteropsis semialata, Panicum natalense* and *Koeleria cristata*.

It is significant that while very definite changes take place in veld protected from grazing and burning, the original composition is maintained by protection from grazing, combined with burning in winter, when the grasses are dormant. This is fairly definite evidence for the view that the existing grassland is a fire maintained sub-climax.

Under conditions of complete protection dead flower stalks persist from one season to the next, affording tall grasses such as *Hyparrhenia hirta* an advantage at the expense of shorter grasses, which are shaded out. Dead trash, which decays very slowly, accumulates and stifles the living plants, causing the appearance of dead patches ready for colonisation by the pioneers of the next stage in the succession.

8. The Reaction to Mowing.

Staples (1930; 11) found that "where the grass has been mown for hay and no burning practised, or mown in winter in place of burning,

the Redgrass (*Themeda triandra*) has also almost entirely disappeared ". This does not appear to be replicated by the results so far obtained at Estcourt and at Tabamhlope Research Stations. Wherever mowing is possible on these stations, the dead top hamper is removed at the end of the winter by mowing rather than by burning. A low cutter bar is used and the grass is cut very short and then raked. This treatment appears to be just as effective as burning at the same time in retaining a good proportion of Themeda in the veld.

In veld which is mowed for hay repeatedly during each growing season (West, 1943 pp. 144–168), *Heteropogon contortus* appears to be increasing at the expense of *Themeda triandra*, but this does not appear to apply to areas where haymaking is rotated with grazing.

The indication is that *Themeda* is discouraged by mowing before it has set seed, but is encouraged by mowing after this period. The density of the cover does not deteriorate when mowing is substituted for burning. Severe defoliation by mowing at short intervals for a long period has a very detrimental effect on the veld.

9. Note on the Root Systems of some Grasses.

A preliminary investigation has been made on the root systems of three grasses, namely, *Themeda triandra, Tristachya hispida* and *Hyparrhenia hirta*. The method adopted in making the bisects was that described by Murray and Glover (1935). The working face of the bisect pit was divided into decimetre squares and as the roots were uncovered, they were charted on sqared paper. Only one root system of each of the grasses investigated was charted. The results are briefly as follows: —

Themeda trandra.—A well developed system of much branched lateral roots spread in a horizontal direction. This system fills the surface soil. The roots were traced to a distance of 3 decimetres from the centre of the tussock. These roots do not descend to a greater depth than 1 decimetre. Deep roots descend more or less vertically and were traced to a depth of $4\frac{1}{2}$ decimetres. This bisect confirms almost exactly the findings of Murray and Glover (1935) at Frankenwald.

Tristachya hispida.—A system of well branched, superficial lateral roots spread in a horizontal direction just below the surface of the soil. These roots were traced to a distance of $1 \cdot 7$ decimetres from the centre of the tussock—the majority of these superficial roots continue to their tips just below the surface, but some bend downwards at a distance of just over one decimetre and descend more or less vertically. Other well developed but less branched roots descend more or less vertically. They were traced to a depth of 4 decimetres at which depth hard shale was encountered.

Hyparrhenia hirta.—Lateral roots are poorly developed. Numerous well developed and much branched roots descend more or less vertically and were traced to a depth of 15 decimetres, at which depth hard dolerite was encountered. The width of the root system at a depth of 6 decimetres exceeded 5 decimetres.

Discussion.

In the ecotonal grassland on the Draycott Plain, *Hyparrhenia hirta*, as already noted (this Chapter, section 3), plays a very important part.

It is one of the dominant species on deep soils which usually overlie dolerite. On shallow soil overlying impervious shale it never approaches dominance and is often entirely absent. The transition from a veld type in which *Hyparrhenia hirta* is one of the dominant grasses to a type in which it is almost absent is often extremely sudden and in undisturbed veld usually marks the limit of a mass of intrusive dolerite, i.e. the transition from a deep soil to a shallow soil on an impervious substratum. This is illustrated in photograph 52. Dominance in undisturbed veld on the Draycott Plain is shared by *Themeda triandra, Tristachya hispida* and *Hyparrhenia hirta*. The nature of the root systems of these three grasses explains the sudden transitions from Hyparrhenia veld to Themeda-Tristachya veld which are so often noticed. In deep soils the *H. hirta* is able by means of its deep root system to avoid competition for water— in shallow soils *Themeda triandra* and *Tristachya hispida* have the advantage and *Hyparrhenia hirta* is ousted. These observations do not apply to Secondary Areas where even on shallow soils *Hyparrhenia hirta* is able to establish and maintain dominance because of the absence, due to the disturbance, of *Themela triandra* and *Tristachya hispida.*

10. A Note on the Effect of Drought on the Grassland.

The ordinary effect of periods of drought on the undisturbed veld is to inhibit the growth and to induce dominancy, but when droughts are unusually severe and prolonged, a certain amount of killing takes place, particularly in veld on shallow soil over impervious shale. This was observed during the very dry 1937–38 season, when small patches of dead veld, caused by the death of the grass plants due to drought, were quite frequent on the Estcourt Station. The patches were all small and were invariably located on very shallow soil over shale.

11. Note on the Indicator Significance of Grassland Communities.

Because plant communities are controlled by and express the conditions under which they grow, they can be regarded as a measure of their environment. This concept developed mainly in America (Clements 1920; Weaver and Clements 1929; 369–420) can, as pointed out by Phillips (1935; 59) be of the greatest possible use in indicating the past history of development and the future possibilities of management in grassland in South Africa.

Indicators of Past History.—Indicators of the past history are provided by the secondary communities described in Chapter IX. Areas which have been cultivated are unmistakably marked by the stages of the Secondary Succession which cover them. The approximate length of the period of abandonment is indicated by the stage to which the secondary succession has advanced. Annual weeds and grasses indicate an area on which cultivation has recently been abandoned. The stage of tall perennial grasses indicates a longer period. In the Highlands this stage is dominated in turn by *Eragrostis robusta, E. curvula* and *E. plana. Eragrostis plana* only becomes dominant a long time after cultivation has ceased. Thus when it is dominant on old ploughed fields, it indicates that the area has not been ploughed for a considerable period. In the ecotonal veld, *Hyparrhenia hirta* dominant on old ploughed fields has the same significance. Patches of *Eragrostis plana* in undisturbed veld usually indicate disturbance caused by trampling and mark the site of gates, fences, roads etc.

Indicators of Overgrazing.—Indicators of overgrazing might have been grouped with indicators of Past History because their appearance indicates that the past grazing has been harmful. Their early recognition is essential, because the intensity of the grazing can be modified before the damage has gone too far.

The disappearance of sensitive species such as *Trachypogon capensis* and the appearance of secondary species such as *Eragrostis plana, Sporobolus pyramidalis, Aristida bipartita* are indications that the intensity of grazing is too high, as are increases in the number of dicotyledonous plants particularly various *Senecio* spp., *Helichrysum* spp. and other Compositae.

Indicators of Conditions.—Communities dominated by *Microchloa caffra* and *Digitaria monodactyla* often indicate extremely shallow soil. *Rendlia nelsonii* indicates shallow soil. A great number of plants indicate a water table at or near the surface. These are all listed in Chapter XIII.

12. The Reaction to Grazing and the Adjustment of Grazing by Domestic Animals to the Veld.

Because the vegetation is the vital link between animal life and the soil, it is essential that it should be maintained at its most productive and stable stage. The evils consequent on the weakening of the vegetation by any form of exploitation are now generally recognised and have been stressed in a multitude of publications, which emanate from countries all over the world. (Jacks and Whyte 1938.)

In Weenen County, Pentz (1938; 1940) has described and discussed the local consequences of misuse of the vegetation. He ascribes most of the existing denudation and erosion to wrong farming systems, which have forced exploitation. A discussion of correct farming systems, the economic size of farming units etc., is outside the scope of this paper, but the reaction of the veld to grazing by domesticated animals must be considered.

The Undisturbed Veld, composed of perennial species specially fitted for survival in a region of uncertain rainfall, is generally acknowledged to be the most desirable type of indigenous grassland. Grazing management must be directed towards maintaining this stage. In this area where the probability of drought is always present and where it is not possible to establish seeded pastures rapidly and successfully, the marriage of the livestock to the soil by means of the plough advocated by Stapledon and his associates (Stapledon 1937) is not possible.

Except under irrigation and in certain limited areas where the rainfall is high and dependable, the ploughing of Undisturbed Veld results in the formation of undesirable and persistent secondary grassland communities and often causes severe erosion.

It has been shown that great damage can be caused by cutting if the defoliation is severe and long continued. (West, 1943 pp. 144–168.)

Defoliation by grazing animals is different from mowing and the grazing requirements of different classes of stock differ considerably. Sheep demand a very short sward which is kept short by constant heavy grazing and by summer burning. In Weenen County sheep have caused much damage to veld and a system of grazing management designed to

benefit the sheep and to maintain "undisturbed veld" does not appear feasible. Cattle on the other hand, providing the management is correct, can be grazed without causing any deterioration of the veld. Cattle tend to graze selectively, and appreciating the increased palatibility and feeding value of young grass, confine their grazing to patches, which they gradually enlarge around the perimeter. This results in the formation of a patchy pasture characterised by small closely grazed areas, surrounded by tall and more or less ungrazed grass. This in itself is not necessarily harmful provided the grazing is not too long continued. It can be regarded as a useful indication that the veld is not overstocked. The unevenness can be remedied by resting during the growing season or by mowing, or burning at the end of winter before the recommencement of growth.

Harm ensues when the intensity and duration of the grazing is such that the grasses are weakened by constant and long continued defoliation. This causes the succession to be set back, the desirable grasses being replaced by undesirable secondary species and by forbs, or the succession may be accelerated towards a higher, but less desirable stage. The acceleration of the succession due to practices which weaken the competition put up by the grasses is described in Chapter IX. It is a common phenomenon in the ecotonal grassland bordering the Thornveld, where overgrazing leads to the encroachment of thorn scrub.

The damage caused to the veld by overgrazing eventually leads to a baring of the cover and the initiation of erosion. Burning is used by graziers to improve the palatability of the grazing and to provide young grass. Where the topography is too broken to permit the use of a mower, burning is necessary to remove the dead top hamper and to even up the grazing. It performs a useful function too, in retarding the succession where the development is towards forest or semi-deciduous bush (this chapter, Section 7) and in retaining the desirable sub-climax grassland. It has been shown that burning at the right time, that is when the grasses are dormant, does not harm the composition of the veld (this chapter, Section 7), but burning may cause serious damage on steep slopes and in other situations where removal of the cover leads to erosion and when it is used during the growing season to obtain young grass and particularly when this young grass is grazed immediately.

Primarily to increase the stock carrying capacity of veld and to minimise or avoid the harmful effects of overgrazing, various systems of grazing management have been devised.

Systems devised for the intensive management of highly productive pastures in countries where the rainfall is high and well distributed, such as the Hohenheim system of rotational grazing (Griffith and Phillips 1929) are not applicable to veld in this area because of the irregular rainfall.

The level of production varies too widely and applications of nitrates are not used effectively (West 1943 pp. 144–168). On irrigated pastures however, the system can be extremely useful.

A consideration of most schemes proposed for the management of veld grazing leads to the conclusion that in the management of veld, adherence to any rigid system is undesirable and that grazing management should be based on a realisation of the fact expressed by Stapledon

(1937) that rotation is essential and that it must be a rotation in time as well as in space. " Swards will recover from the most villanous of malpractices if such malpractices are not too long continued and if they are not put into operation at precisely the same time each year, year after year." Attempts to obtain full utilisation by the grazing animal on the veld, of the green matter produced by the veld, are doomed to failure and invariably give rise to the symptoms of severe overgrazing. Waste must be avoided not by increasing the intensity of stocking and mowing until everything is removed, but by conserving the resources of the veld by limiting the use to that level which the veld is able to tolerate, and by substituting less wasteful practices for wasteful ones e.g. mow the top hamper before spring and use it for bedding, which will ultimately be converted to compost, rather than remove it by burning.

It has been found at Estcourt and at Tabamhlope that cattle do well and show satisfactory increase in weight on veld grazing during the growing season, but when the grasses stop growing at the beginning of winter, the veld is no longer sufficient to maintain them. (The season can be lengthened by grazing the aftermath on mown areas.) Thus it is necessary to conserve during the growing season sufficient grass in the form of ensilage and hay to supply their needs during winter.

The work carried out at Estcourt (West 1943 pp. 144–168) shows how necessary it is to conserve young grass if a high quality, protein-rich fodder is desired.

Young grass hay made on the stations has proved over several seasons to be a satisfactory maintenance ration for dry stock. It is highly probable that young grass could be conserved to better advantage if it were ensiled and this branch of fodder conservation must be developed in the future.

It has been shown that the losses in terms of nutritive value are much less in ensilage than in hay (Oleson 1937, Eskedal 1937, Horwood and Wells Jnr., 1936, Archibald and Parsons 1939).

Grass drying, the least wasteful method of conservation, is impractical because of the difficulty of cutting and handling very short grass on the uneven sward characteristic of undisturbed veld.

Allowing for the conservation of food for use during the winter, a very successful and flexible system of grazing management has been evolved at Estcourt. It is a system in which rotation takes place in time as well as in space. The grazing area is divided into five camps. At the very beginning of the growing season, when growth is slow and it is necessary to graze very lightly (Critical Growth—Rowland 1937 pp. 7), the stock are divided evenly over the entire area. When the veld begins to grow rapidly, two camps are closed and are reserved during the rest of the season for hay production. Of the remaining three camps one is rested during the spring flowering period (*Themeda triandra* etc.) one during the late summer flowering period and the third is given an autumn rest. At the end of the growing season, the animals are removed to their winter quarters where they are fed on the hay cut from the two hay camps. During the next season the rotation is pushed forward one camp, so that at the end of five years each camp will have experienced the three rests and will have been reserved for hay production during two seasons.

This system is proving very satisfactory and the condition of the veld is improving, but results obtained in a clipping experiment (West 1943 pp. 144–168) indicate that the flowering period rests may be improved by modification. At present they are begun when flowering is general. The results referred to, indicate that the rest should begin some time before the commencement of flowering.

The rate of stocking at Estcourt is one beast to five acres, three of which supply summer grazing and two are used to provide hay for winter feeding. At Tabamhlope 3–4 acres per beast is sufficient.

(Details of weight increases on veld and on hay are given in reports published in "Pasture Research in South Africa" Progress Report No. 2 1940 pp. 315–370.)

13. Planted Pastures and Exotic Grasses.

The work done is covered in reports published in "Pasture Research in South Africa" Progress Reports Nos. 1 and 2. See West 1938 (*b*), Scott, West etc. 1938, 1940, (*a*) and 1940 (*b*).

It is proposed to discuss this aspect more fully elsewhere especially in relation to the function of temporary pastures in restoring and maintaining the structure and fertility of cultivated soil.

CHAPTER IX.

THE PLANT SUCCESSION IN GRASSLAND.

Before discussing the Plant Succession it is necessary to define the terms: *Plant Succession* is the term used to describe the process by which the same area is successively occupied by different communities of plants as the vegetation develops. These successive stages eventually culminate in a final or climax stage which is determinated by the climate. The succession begins on a bare area, and as initial bare areas differ in type, they may conveniently be classified into Primary and Secondary areas. *Primary areas* comprise water, rock and sand. In them conditions are extreme and development is slow and of long duration (Clements 1928; 60). The succession originating on a primary area is a *Primary Succession.* The series of stages through which the vegetation passes from the colonisation of the initial bare area to the establishment of the climax community constitutes a *sere.* If the sere begins in water it is called a *hydrosere,* on bare rocks, sand or other situations, where there is an extreme deficiency in water, a *xerosere* (Weaver and Clements, 1929; 55). This distinction between hydrosere and xerosere is not topographic but climatic and is based on the essential nature of a bare area which is expressed in amount and kind of water. (Clements 1928; 60.)

Denudation during the course of succession results in the reappearance of earlier conditions, that is a *Secondary Area.* It causes the repetition of certain stages and this is known as the *Secondary Succession.* The extent of denudation may vary considerably causing much variation in the length of the resulting sere. If the denudation consists only in the destruction of the vegetation leaving the soil factors relatively unchanged, it initiates a short sere of few stages, but denudation may produce conditions approaching the original primary area with a correspondingly long and complex sere.

1. The Primary Succession in the Topographical Regions Covered by Grassland.

The primary areas are mainly water. Rock areas are limited to small exposures. Sand may be disregarded.

(i) *The Hydrosere.*

The principal areas in which this sere can be studied are vleis well developed along streams on the Little Berg and on the Tabamhlope Plateau. These vleis or marshes are sometimes of considerable extent, with numerous pools connected by meandering streams. There is a particularly fine example along the Little Bushman's River on the Tabamhlope Research Station, and it is in this vlei that most of the following observations were made.

In the hydrosere the pioneer communities are found in free water. The reciprocal reactions of community and habitat causes the succession to advance through stages which are accompanied by a corresponding drying-up of the habitat until the vegetation and habitat become stable

and the climax is reached. The principal stages in this sere, determined by a careful study of the community and habitat relations made principally in the Tabamhlope Vlei, are described.

(A) *Stage of Submerged Water Plants.*

The plants occur in shallow water, seldom deeper than 2-3 feet and are rooted in the bottom mud.

Herb-like Algae belonging to the Characeae are prominent and are usually the first plants to appear. They form dense masses of vegetation often covering the bottoms of shallow pools and slow streams. Growing about 6 inches tall, the plants hold up large quantities of silt brought in by flood water. This helps very considerably in the building up of the bottom and reduces the depth of the water. Other submerged plants further this process. *Lagarosiphon muscoides* is important. Rooted in the bottom mud it produces masses of vegetation which reach up through the water and lie just submerged. (Photograph 17.) *Utricularia exoleta,* a rootless aquatic plant, which floats below the surface is abundant in still, shallow water. *Limosella lineata, L. major* and *Aponogeton spathaceum* occur in very shallow water. They prefer areas that are often bared and really belong to the Sedge Meadow Stage.

(B) *Stage of Floating Plants.*

This stage, important in classic descriptions of the hydrosere, is very poorly represented, often it is almost entirely absent.

The floating form of *Riccia fluitans* sometimes covers still ponds and small water holes. *Nasturtium officinale* is widespread and, where conditions are suitable, produces dense masses of shoots and leaves on the surface of slow flowing streams. *Polygonum tomentosum* and *P. meisnerianum* flourish over a wide range of conditions and can be found growing on damp ground as well as in quite deep water. Sometimes *P. tomentosum* forms an associes with *Nasturtium officinale,* the shoots of the Polygonum projecting through the floating mass of Nasturtium. *Nymphaea* spp. do not occur.

(C) *The Reed Swamp Stage.*

This stage is always very important. It consists of plants which are rooted in the mud and partially submerged but whose foliage is raised above the surface of the water. The communities of the reed swamp stage react on the habitat in a very marked manner, building up and extending the margin at the expense of the free water surface by retaining sediment and debris carried in flood water and by contributing a considerable quota of plant remains.

The principal communities of the reed swamp stage are:—

The Phragmites communis Consocies. (Photograph 18.)

The *Phragmites communis* grows in quite deep water (2–3 feet). It forms a dense and tall community, the reeds projecting about 8 feet above the surface of the water. The Phragmites reeds are valued by the Natives for the construction of palisades around their huts and are cut in winter for this purpose. Native women travel many miles to obtain a few bundles of reeds.

The Cyperus fastigiatus Consocies. (Photograph 19.)

Cyperus fastigiatus is a tall leafy rush ($3\frac{1}{2}$–4 feet tall) which will grow in water about two feet deep. In the absence of *Phragmites communis,* it may initiate the reed swamp stage, but more usually occurs as a dense consocies immediately behind an anterior zone of *Phragmites communis.* Sometimes *Scirpus corymbosus* occurs with it as a co-dominant forming the *Cyperus fastigiatus—Scirpus corymbosus* associes.

The Typha capensis Consocies. (Photograph 19.)

Typha capensis forms a dense and tall consocies. It is often found in shallow water or in sites subjected to periodic inundation. It colonises boggy flushes where there is no free water on the surface. Sometimes it occurs mixed with Phragmites in the Phragmites—Typha associes, described by Phillips (1931; 109).

Juncus spp. Communities.

Stretches covered by shallow water exhibit a much less tall aspect of the reed swamp stage. *Juncus oxycarpus, J. exertus* and *J. rostratus* are prominent in this aspect. The plants seldom exceed 2 feet in height and grow in water which is usually about 6 inches deep. They form consocies or associes which are often of considerable extent.

In the Tabamhlope Vlei, *Utricularia exoleta* flourishes in this community, filling the shallow water between the *Juncus* spp. plants with a mass of vegetation. In shallow running water in rivers, *Cyperus marginatus* forms a similar consocies.

The Leersia hexandra Consocies. (Photograph 19.)

The grass *Leersia hexandra* forms a dense and often very extensive community which occupies the outermost zone of the Reed Swamp Stage. It flourishes in shallow water.

Secondary Species of the Reed Swamp Stage.

Associated with the plants which dominate the various communities of the reed swamp stage are many secondary species which add to the mass of vegetation and aid in bringing about the reactions caused by this stage of the succession.

The secondary species are not usually confined to any particular community but occur throughout. They are smaller plants and often form conspicuous socies within the communities characterised by the various dominants.

Sium thunbergii occurs in the deepest water and is very prominent in the *Phragmites communis* consocies. *Mentha aquatica* is conspicuous in the exterior zones, where the water is shallow. *Leersia hexandra* which dominates an important consocies already mentioned appears frequently in other communities. *Polygonum tomentosum* is frequent. Numerous other species more characteristic of the sedge meadow stage occur also in the reed swamp stage.

Reaction and Development.

The dense communities of the reed swamp stage produce an accumulation of plant remains and this, together with the sedimentary matter and debris retained by the living plants leads to a rapid shoaling of the water. As the depth of the water decreases conditions become less and less suitable for the plants of the reed swamp stage. Consequently they develop less vigorously and their territory is invaded by plants more tolerant of the drying conditions of the habitat. The invaders, aided by the retreat of the water and by the increased light consequent upon the disappearance of the taller reed swamp stage plants, assume dominance and convert the reed swamp to sedge meadow.

(D) *The Sedge Meadow Stage.*

The Sedge Meadow Stage (Weaver and Clements 1929; 58) is equivalent to the stage of Semi-aquatics of Bews (1920; 397), Phillips (1932; 110) and Dyer (1937; 61).

The term Sedge Meadow Stage is preferred because it portrays more accurately the appearance of this usually very extensive zone in the local hydrosere.

The plants which characterise this stage must be capable of growing under a wide range of water conditions. They are subjected to periodical inundation and during the rainy season, the soil may be covered by water several inches deep for considerable periods.

During droughts and in winter on the other hand, the water table may sink well below the soil surface. The width of the Sedge Meadow zone depends on the topography.

Where the ground level rises steeply it is narrow and the stages of the succession, confined to very narrow zones, are easily interpreted, but where the topography is more or less level, the same general soil water conditions obtain over wide areas and so the Sedge Meadow Stage occupies a very wide zone in which innumerable local variations in the edaphic factors caused mainly by minor irregularties in the topography, give rise to a complicated mixture of communities, which demand much study if their relationships are to be understood. The extensive Tabamhlope Sedge Meadows present over much of their area a peculiar surface made up of irregular hummocks separated by a network of channels. Under normal conditions of rainfall, when the meadows are not flooded, water relations at the top of the hummocks are vastly different from those at the bottom of the channels. Often the soil at the top of the hummocks is fairly dry but becomes increasingly moister down the side, until at the bottom of the channel it is covered by a thin film of water. Thus the hummock type of Sedge Meadow presents a *layered habitat* in which plants exhibiting very different degrees of tolerance towards the amount of water present, may grow side by side. The formation of these hummocks has been studied and although many points are obscure they are apparently due to a number of causes. They are not present in the stages that precede the Sedge Meadow Stage and only begin to make their appearance some time after the inception of this stage, that is, on ground which is periodically inundated and periodically dry.

Plants, particularly the sedges and grasses, play an important role.

Flood water from the neighbouring grassland brings in masses of floating debris. When the water subsides, this is deposited on the tops of tussocks. New shoots from the covered plants grow through the debris and fix it in position and a hummock is begun.

Ants make their appearance and construct heaps which may be begun on these ready-made foundations. The ant heaps attain a height of from 18–24 inches with a proportionately broad base. The vegetation grows on and through the heaps and fixes them permanently. Three species of ants responsible for these heaps have been collected, but have not yet been identified.

Mole rats, very common in the drier parts of the sedge meadow stage, throw up hills which are fixed by the vegetation. The ants appear to be the most important building agents, while the vegetation acts as the cement which fixes the mounds however they may have been formed.

Earthworms too, play an important part in raising the general level of the ground surface. They are present in great numbers in the very wet soil between the hummocks and the casts they bring to the surface are fixed by the plants.

The Plant Communities of the Sedge Meadow Stage.

The communities of the sedge meadow stage are dominated first by sedges and then by hygrophilous grasses. The usual communities are very mixed associes. The following are conspicuous: *Cyperus denudatus, Pycreus lanceus, P. oakfortensis, P. flavescens, Mariscus sieberianus, M. congestus, Kyllinga erecta, K. alba, Fuirena pubescens, Scirpus cernuus, S. paludicola, Bulbostylis collina* and *Juncus effusus*.

Of the grasses *Hemarthria altissima, Arundinella ecklonii, Andropogon appendiculatus, Phalaris arundinacea, Agrostis lachnantha* and *Pennisetum sphacelatum* are very important.

Eragrostis nebulosa and *Aristida junciformis* dominate consocies, which are sometimes extensive, but possibly belong to the Secondary Succession.

Secondary Species of the Sedge Meadow Stage.

A great number of flowering plants, monocotyledons and dicotyledons, are present as secondary species in the communities dominated by the sedges and the grasses. These plants, too numerous to list here, are dealt with in Chapter XII.

The most conspicuous are: *Aponogeton spathaceum, Anthericum* spp., *Kniphofia* spp., *Anoiganthus breviflorus, Hypoxis* spp., *Hesperantha lactea, Dierama trichorizum, Gladiolus papilio, Rumex crispus, Polygonum tomentosum, P. meisnerianum, Ranunculus meyeri, R. pubescens, Crassula inanis, C. lineolata, Alchemilla woodii, Agrimonia eupatoria* var. *capensis, Geranium ornithopodium, G. caffrum, Ludwigia palustris, Epilobium flavescens, Gunnera perpense, Alepidea* spp., *Pimpinella caffra, Chironia krebsii, C. palustris, Pycnostachys reticulata, Diclis reptans, Mimulus gracilis, Limosella lineata, L. major, Alectra melampyroides, Utricularia livida, Valeriana capensis, Wahlenbergia undulata, Lobelia decipiens,*

Nidorella auriculata, N. anomala, Denekia capensis, Gnaphalium luteo-album, Helichrysum epaposum, H. umbraculigerum, Senecio speciosus, S. erubescens and *S. latifolius.*

The reactions produced by the communities of the Sedge Meadow continue the drying of the habitat. Both plants and animals play, as has been shown, an important part in the building up of the substratum and the plants transpire great quantities of water. Eventually the habitat becomes too dry for the species of the Sedge Meadow Stage and they are replaced by invading species less tolerant of wet conditions.

The sedge meadow develops towards a *Pennisetum sphacelatum—Andropogon appendiculatus* Associes in which *Kyllinga erecta* and *Hemarthria altissima* occur as secondary species. This associes is invaded and eventually replaced by the species characteristic of Undisturbed Veld.

(ii) *The Xerosere.*

The xerosere is initiated on areas where there is an extreme deficiency of water. In the region under discussion these areas are limited to bare rocks, a topographical subdivision of the xerosere known as the *Lithosere.* Bare rock areas in the grassland region are not extensive and the sere initiated on them has received only passing notice. The pioneers on bare rock faces are Blue Green Algae and Lichens, first crustose and then foliose. These primitive plants assist the natural weathering of the rocks by secreting carbon dioxide with which the water forms a weak acid. They not only assist the process of weathering but retain some of the products and eventually build up a substratum which permits the invasion of colonies of mosses and liverworts.

Soil accumulates comparatively rapidly during this stage. The mosses form a mat which retains soil and moisture and permits the germination of seeds of higher plants. *Selaginella ruprestis* usually comes in at this stage and aids considerably in the process of soil formation. Numerous xerophytic plants germinate and grow in the mat and the soil retained by it. The flora at this stage is a very large one and includes ferns, Cyperaceae and numerous monocytelodons, xerophytic grasses, succulent Mesembryanthemum and Crassulaceae, xerophytic Compositae and many other dicotyledons. On krantzes, *Aloe arborescens* is very conspicuous. The grasses of the undisturbed veld are not important until the soil is several inches deep. *Microchloa caffra* and *Digitaria monodactyla* are the first to appear in this shallow soil. They are often followed by *Rendlia nelsonii.*

2. The Secondary Succession in Grassland.

Denudation during the course of succession results in the reappearance of earlier conditions i.e. the establishment of a secondary area. The resulting sere is known as the Secondary Succession. The length of the secondary sere depends largely on the extent of the denudation. Slight denudation, such as is caused by heavy grazing if not too long continued, results only in the partial destruction of the existing community, evidenced first by the disappearance of species such as *Trachypogon capensis,* which are intolerant of disturbance and then by the influx and increase of pioneer species such as *Eragrostis plana, E. curvula* and *Sporobolus pyramidalis.* This type of denudation leaves much of the existing vegetation *in situ* and the soil factors are not much changed. When protected

from grazing the veld quickly recovers. When denudation produces *Secondary Bare Areas* and particularly when the soil factors are changed the resulting sere is long and complex.

The usual secondary bare areas are those caused by cultivation, extreme overgrazing combined with trampling and erosion, road making etc.

(i) *Old Ploughed Fields.*

A large proportion of the area is covered by stages of the secondary succession on abandoned cultivation. The stages are as follows:—

(A) *The Stage of Annual Weeds.*

Immediately cultivation is abandoned, annual weeds kept under control by cultivation, when crops are being grown, come into their own and for a short period completely dominate the area. The composition of this weed flora varies greatly in different localities. It is controlled by the factors of the habitat and by the presence or absence of gemules.

Rivers are very important agents in the migration of weed gemules. During heavy rains, weed seeds, fruits etc., are transported by run-off water from cultivated fields into streams and rivers and are re-deposited on river flood plains, when the swollen waters recede.

It follows that the weed flora of " river lands " is much larger than that on fields situated above the levels of river flood plains. At Tabamhlope, where most of the cultivated area is high lying, the weed flora consists of much fewer species than are represented in the irrigated river lands at Estcourt.

The length of the period of cultivation is also important. Areas which have been cultivated for a long period show a large and varied weed flora in which the proportion of exotic weeds is very great.

When undisturbed veld is first brought into cultivation the weed flora is limited and contains many indigenous plants such as *Commelina africana, Oxalis* spp., *Erigeron canadense, Erigeron unifolius, Senecio burchellii* and *Senecio pellucidus* var. *nideralis* as well as the annual grasses.

The weed flora of cultivated fields is fully listed in Chapter XII.

The annual grasses play a very important role in this stage of the secondary succession. In the Highlands *Digitaria adscendens**, *Panicum laevifolium* and *Setaria pallidifusca* assume complete dominance in abandoned cultivation during the latter half of the first season of disuse. They form a dense tall cover during late summer which can be converted into excellent hay or ensilage.

The " Lands Grass " Stage is often purposely prolonged by farmers who allow the seed to fall before reaping and in the following spring, plough or harrow and roll in order to retain the degree of tilth which favours the desirable annuals.

In river lands at lower levels, the grasses are not usually such important members of the annual weed stage, but more species are represented—*Urochloa panicoides*† is very abundant with *Eleusine indica,*

* *Digitaria adscendens* (Kunth) Henrard (= *D. marginata* Link).

† *Urochloa panicoides* P. Beauv. [= *U. helopus* (Trin.) Stapf].

Digitaria horizontalis, D. sanguinalis, D. ternata, Paspalum scrobiculatum, Phalaris minor, Brachiaria eruciformis, Eragrostis ciliaris and *E. tef.* On high lying fields on the Draycott Plain *Rhynchelytrum repens* is usually very abundant.

(B) *The Cynodon dactylon Stage.*

Cynodon dactylon, a turf forming, rhizomatous grass is a particularly troublesome weed in maize fields which crop is not dense enough to suppress it by shading. Cultivation during the growing season spreads it throughout the fields.

When abandoned fields are protected from grazing the ruderals quickly assume dominance and the Cynodon is shaded out, but when cattle are allowed to graze the maize stalks and weeds, Cynodon may assume dominance and if the grazing is very heavy and continued this grass persists for a long time, forming a turf which affords good grazing during the rainy season. The Cynodon Stage is alternative or supplementary to the stage of annual weeds.

(C) *The Stage of Tall Perennial Secondary Grasses.*

Considerable changes take place in the physical condition of cultivated soil that is allowed to lie fallow. It becomes more compact and the water relations change. These changes are unfavourable to the annual weeds and Cynodon. They give way to tall perennial grasses which rapidly assume dominance and eventually entirely suppress the annual flora.

In the Highlands, *Eragrostis robusta* is dominant in old fields the third season after abandonment. (Photograph 20.)

It forms consocies in which *Eragrostis curvula, E. plana* and other *Eragrostis* species occur. It is succeeded by an associes in which *Eragrostis curvula* and *E. plana* are the dominant species. Eventually *Eragrostis plana* assumes dominance and establishes a consocies that is extremely persistent.

On the Draycott Plain, the members of this stage are more numerous —*Eragrostis robusta* and *E. plana, Sporobolus pyramidalis* and *Hyparrhenia hirta* are all important. Here too the stage is a very persistent one. *Hyparrhenia hirta* gradually assumes dominance and may give rise to a consocies in which other grasses play a very small part. These associations are eventually invaded by the species characteristic of undisturbed veld. Numerous instances of this last stage in the secondary succession have been observed, but very little is known about the length of the stage of Tall Perennial Secondary Grasses.

(ii) *Other Secondary Areas.*

The secondary succession on bared areas other than cultivated fields shows considerable differences in the early stages. In old kraals, paddocks etc., where denudation has been caused by trampling and where there is a heavy deposit of dung, the *Cynodon dactylon* stage is usually prominent and because these areas usually afford very palatable grazing and are much favoured by stock, the *Cynodon dactylon* stage is maintained for a long time.

Cynodon is prominent too, on old termitaria, warrens and disused roads. Members of the Solanaceae are conspicuous members of the warren flora.

In the Ecotonal region, hard bare areas caused by overstocking, trampling and sheet erosion etc., are colonised by *Aristida congesta, A. barbicollis, A. curvula, Tragus racemosus, Gomphrena decumbens* var. *genuina, Alternanthera repens* etc. In dongas in the same area, *Hyparrhenia hirta* and *Bothriochloa insculpta* play a very important part. Small disturbances in undisturbed veld such as fire breaks and paths denuded by hoeing, are colonised by *Brachiaria eruciformis, Urochloa panicoides* and by many of the Dicotylendonae present in Undisturbed Veld, *Diclis reptans, Cynoglossum* sp., *Physalis angulata, Erigeron unifolius, Walafrida densiflora, Solanum* sp., *Dicoma* sp., *Senecio* sp., *Schkuhria bonariensis, Hermannia depressa, Gazania longiscapa, Graderia scabra* and many others are important.

3. The Secondary Succession on Experimentally Denuded Areas.

Summary of Results.

Denuded quadrats laid down in various communities at Estcourt and at Tabamhlope have yielded interesting information on the Grassland Succession and on the status of the constituent species of the various grassland communities.

Two types of denudation were imposed on square metre quadrats:—

(i) *Dug, Denuded Quadrats.*—The area was completely denuded and dug to a depth of 9 inches. The soil was then sieved and replaced very carefully, as far as possible in its natural sequence.

(ii) *Hoed, Denuded Quadrats.*—By means of a pickaxe the vegetation was removed with as little disturbance as possible (photograph 31). It is impossible to remove completely all the underground parts of the existing vegetation by this method and so for some time after denudation, the hoed-denuded quadrats were carefully watched and any shoots arising from roots or underground stems left in the quadrat are removed, together with the underground parts from which they grow.

Quadrats were laid down in groups of three, a dug-denuded quadrat, a hoed-denuded quadrat and a protected and undisturbed quadrat. In all, six groups of quadrats were studied, as follows:—

Group 1.—These were laid down in the firebreak of a protected block at the Estcourt Pasture Research Station, in Themeda-Hyparrhenia veld described on page 82, Quadrat No. 10. The plots were protected from grazing, but were burnt annually in winter.

Group 2.—This group is comparable with Group 1, being laid down only a few yards away, in similar veld. In addition to protection from grazing, however, they were also protected from burning (page 82, Quadrat No. 16).

Group 3.—This group was laid down in a protection block on the Estcourt Station in dense Themeda veld described on page 82, Quadrat No. 19. As in the case of Group 2, the veld in which the quadrats were located was protected from both grazing and burning.

Group 4.—This group of quadrats was laid down in similar veld and only a few yards away from the quadrats of Group 3. Although protected from grazing, the plots were burnt annually in winter (page 82, Quadrat No. 22).

Group 5.—These quadrats were laid down on the Tabamhlope Pasture Research Station in a typical example of the *Eragrostis plana* consocies which plays an important part in the secondary succession in the highlands. The date when the area was last ploughed was probably more than ten years before the quadrats were laid down. The quadrats were protected from grazing and burning. The composition of the veld (Quadrat No. 26) when charted on 10.3.39 was:—

	Per Cent.
Eragrostis plana	24·0
Eragrostis curvula	4·6
Eragrostis sp.	3·9
Percentage area covered	32·5

Group 6.—This group was laid down in typical undisturbed veld on the Tabamhlope Pasture Research Station, and was protected from grazing and burning during the course of the investigation. When charted on 15.3.39 (Quadrat No. 28), the composition of the veld was:—

	Per Cent.
Tristachya hispida	6·6
Themeda triandra	5·5
Eragrostis chalcantha	4·6
Andropogon filifolius	4·4
Digitaria tricholaenoides	3·9
Trachypogon capensis	3·1
Eragrostis capensis	0·5
Harpechloa falx	0·5
Alloteropsis semialata	0·5
Monocymbium ceresiiforme	0·4
Percentage area covered	30·0

The quadrats on the Estcourt Pasture Research Station were denuded during the winter of 1937 and subsequent observations were made during 1938, 1939 and, at the conclusion of the investigation, in November 1941. Those on Tabamhlope Pasture Restarch Station were denuded in March 1939 and were charted again in 1940 and, finally, in November 1941.

At each observation, a pantograph chart for each quadrat was drawn and in this way a permanent record was kept of the progressive changes taking place on each quadrat. The progress observed in the protected quadrats has already been discussed in Chapter 8, Section 7.

The Stages of the Succession.—The experimentally bared areas used in the investigation were small and they were located in, and entirely surrounded by, extensive and more or less homogeneous communities.

It is not surprising, therefore, that many plants characteristic of the secondary succession did not appear during the period under survey. Only those gemules present in the soil at the time of denudation, and those which were transported thereto by various agents after denudation were able to give rise to plants.

In Groups 1, 2, 3 and 4 at Estcourt, there was a well marked stage of annual weeds, which was usually dominated by the grass *Urochloa panicoides*. *Physalis angulata* and *Erigeron unifolius* were the most conspicuous Dicotyledons. *Aristida bipartita*, usually present during the first season, became increasingly important during the second and third seasons, while the importance of *Urochloa panicoides* diminished. *Themeda triandra, Heteropogon contortus, Tristachya hispida, Setaria nigrirostris* and *Hyparrhenia hirta* usually appeared during the first season; *Themeda triandra* invariably, *Hyparrhenia hirta* less commonly. On the dug and sieved quadrats, the majority of these plants failed to survive the first winter and, at the termination of the study, these plots were still relatively bare, while the hoed-denuded quadrats had returned to a condition resembling the control quadrats.

Individual *Setaria nigrirostris* and *Hyparrhenia hirta* plants were generally more successful in establishing themselves than *Themeda triandra, Heteropogon contortus* or *Tristachya hispida*, but there were usually more *Themeda triandra* seedlings and hence more survivors of this species.

In undisturbed veld at Tabamhlope (Group 6), no representatives of the stage of annual weeds appeared during the period under study. Some plants characteristic of the undisturbed veld succeeded in establishing themselves on the hoed-denuded quadrat, but the dug-denuded area remained relatively bare until the end of the investigation. None of the Eragrostis species characteristic of the secondary succession were represented in either plot.

In the disturbed veld (*Eragrostis plana* consocies), (Group 5), the stage of annual weeds was omitted and the denuded areas were colonised by perennial *Eragrostis* spp.

At all stages in the colonisation of these bared areas, except in Group 5, plants were generally distributed over the entire area. The quadrats in Group 5 lay on a steep slope and in them colonisation began at the bottom of the slope, where the water relations were less extreme. The migration from the border, noted by Arrhenius (1936) was not noticed except in the case of the rhizomatous *Setaria nigrirostris*.

The Length of the Sere.—The most striking point observed in this series of quadrats was the difference in the length of the resulting sere in the two types of denuded areas.

In the first, where, besides the removal of the vegetation, the soil factors were changed by digging and sieving, the areas were still bare at the end of the study and only a few plants had succeeded in establishing themselves. This was approximately four and a half years at Estcourt, and

two and three quarters at Tabamhlope, after the areas were denuded. Each season, during periods of high rainfall when the soil in these quadrats was kept moist, large numbers of seedlings were observed but many of them were not able to survive periods of drought, which occurred during the growing season. Changed water relations induced by the digging and sieving seemed to be responsible for the failure in establishment.

Where denudation was confined to the removal of the vegetation and the soil structure was left as far as possible intact, a great number of seedlings were able to become established, and on this type of bare area the sere was remarkably short. Where the area was situated in undisturbed veld, a large number of species characteristic of undisturbed veld was already established at the end of the first season after denudation, and the composition and appearance of these quadrats four years after denudation was extremely like that of the surrounding undisturbed veld.

It is interesting to note that these observations apply also to denuded areas located in secondary communities, as similar colonisation by surrounding species (in this case *Eragrostis* spp.) occurred in the series outlined under Group 5.

CHAPTER X.

THE SEEDING HABITS AND THE GERMINATION OF THE SEED OF CERTAIN LOCAL GRASSES.

A study of the seeding habits, seed germination and seedling development of important grassland species was completely interrupted at the outbreak of the war in 1939. The preliminary results are interesting and are given here.

Germination Test Technique.

In evolving a technique for testing the germination of veld grass seeds, the importance of obtaining comparable results in tests made at different times and by various workers both here and in other countries, was fully recognised and for this reason the scheme of "International Rules for Seed Testing" drafted at the International Seed Testing Congress were closely followed. Considerable help was obtained from the "Official Rules for Seed Testing" based on the International Scheme and published by the Governments of the U.S.A. and Canada. The Seed Testing Stations at Edingburgh, Ottawa, Dublin, Belfast, Cambridge, Palmerston North in New Zealand and the Agricultural Experiment Stations at New Hampshire and New Brunswick in the U.S.A. generously supplied information about technique and apparatus.

After various preliminary experiments the following technique was finally adopted: 8 cm. diameter glass petri dishes were used to contain the seeds (an 8 cm. dish holds 100 *Themeda triandra* seeds coveniently spaced). W. & R. Balston, Ltd., genuine Whatman, chemically-pure filter paper, 9 cm. in diameter, specially made for seed testing was used as a substratum, and this substratum was kept just visibly moist during tests.

When it was necessary to add water in order to increase the dampness of the substratum, it was done in the following manner. A pair of forceps was used to hold and lift the upturned edge of the filter paper and water was dripped between the filter paper and the glass by means of a pipette.

When added in this way the water spreads quickly over the glass bottom of the petri dish and all of the filter paper substratum is made equally wet. If water is dripped on the upper sides of the filter paper it spreads slowly and displaces the seeds.

Tests were made in batches of 100 seeds, counted and evenly spaced by hand over the surface of the filter paper. Each test was replicated at least 6 times and occasionally 10 replications were used. The even, wide spacing of seeds over the substratum is important, making for ease in counting germinated seeds and helping to prevent the spread of moulds from diseased to healthy seeds.

Hearson Seed Incubators which could be run at any temperature between 20° and 40° C. (high summer, room temperature made it difficult to regulate the incubator below 30° C.) were used to maintain constant temperatures during tests. When it was desired to subject germinating seeds to alternating temperatures their containers were shifted from one

incubator to another at the proper times. Counts of germinated seeds were made each morning, because it was desirable in most tests to preserve a record of the speed of germination. A seed was counted as germinated when both plumule and radicle had emerged. At the counting each morning, the germinated seeds were removed from the petri dishes and the number removed from each dish was noted on a label pasted to the dish cover. The final count was made on the morning of the 29th day. Thus all seed tests ran 28 days.

All of the seeds used in the germination tests detailed in this chapter were collected on the Estcourt Research Pasture Station.

In order to ensure that the seed used in comparative tests should be uniform, and to eliminate as far as possible differences due to strain, habitat etc., an area located in typical Undisturbed Veld was fenced off and reserved for seed production. Seed of the following species was obtained from this camp: *Themeda triandra, Hyparrhenia hirta, Tristachya hispida, Trachypogon capensis* and *Eragrostis chalcantha.*

Seed of the pioneer *Aristida* spp., *Eragrostis curvula, E. robusta* and *Sporobolus pyramidalis* was obtained from patches of secondary grassland located on abandoned cultivation, areas bared by trampling etc.

Seed was collected by hand and care was taken to collect only ripe infructescences.

After collection the seeds were cleaned from the infructescence. When possible the glumes and awns were removed. Seed was stored in labelled glass bottles.

I. *Themeda triandra.*

Throughout the area this well known grass plays an important part in the undisturbed veld. Quadrat analyses have shown that it is often dominant and may contribute as much as 27·3 per cent. of the total (basal area) cover. It begins flowering very early in the season, about a month after the first signs of growth and flowering continues for a considerable period.

The following phenological observations are illustrative. They were made in a small area protected from grazing at Estcourt. During the growing season 1938–39 shooting began about the middle of September. On the 11.10.38 no *Themeda triandra* flowers could be observed, but on the 20.10.38 large numbers of flower heads were visible. By the 3.11.38 there were plenty of unripened seeds. Ripe seeds were collected between 23.11.38 and 8.12.38.

Germination, Dormancy and Length of Period of After-ripening.

The first *Themeda* seed was collected on 10.2.38. It was tested in various ways over a period of several months with very little success. The seed was apparently healthy but dormant and could not be induced to germinate. A series of tests over a period of years has made it clear that the seed of *Themeda triandra* always exhibits this period of dormancy.

Seed collected on 10.2.38. and tested over a period of years gave the following percentage germination figures:—

Seed.	Date of Germination Test.	Percentage Germination.
E.747., collected in Experiment 19 on 10.2.38	8.4.38	6·4
	1.6.38	38·4
	4.1.39	89·7
	23.5.39	79·8
	8.6.39	74·0
	9.4.40	75·5
	21.10.41	70·1

All tests with the exception of the first two consisted of 6 replicates of 100 seeds each at 30° C., in a Hearson Incubator.

Seed collected during the 1938-39 season and the 1939-40 season behaved in a similar manner. These tests consisted of 6 replicates of 100 seeds at 30° C. in a Hearson Incubator.

Seed.	Date of Germination Test.	Percentage Germination.
E. 833. Collected in Experiment 19 on 23.11.38	6.12.38	0·9
	4.1.39	1·7
	7.6.39	47·3
	27.6.39	56·3
	24.4.40	54·3
	25.10.41	56·0
E. 872. Collected in Experiment 19 on 8.12.39	12.12.39	0·7
	16.2.40	10·2
	9.4.40	39·5

Dormancy is a phenomenon exhibited by the seeds of many uncultivated plants. The causes may be due to external conditions such as temperatures, too low or too high for germination, lack of water or in the case of buried seeds, lack of oxygen or sometimes light. (Weaver and Clements 1929; 113–115.)

Obviously in the case of Themeda seed tested under laboratory conditions the external conditions could not be responsible and so the causes of dormancy must be looked for within the seed itself.

In many seeds, dormancy is due to the condition of the seedcoat which may be impermeable to water or to oxygen. In other cases the mechanical resistance offered by the seed coat prevents germination.

In many seeds a period of dormancy is needed to complete the development of the embryo, which in many plants is incompletely developed when the seed is shed; this has been shown by various workers (see Weaver and Clements 1929; 117). Dormancy may be due to a lack of acidity which affects the enzyme activity on which germination is dependent (Weaver and Clements 1929; 115–117).

Preliminary trials made during 1938 of various treatments designed to break dormancy and promote germination served only to indicate that germination increased with the age of the seed but positive results

were obtained in a series of tests made during December 1938 on fresh 1938–39 season seed and during February 1940 on fresh 1939–40 seed.

These tests were all made on lots of 100 seeds, replicated 6 times and the results were interpreted by means of tolerance tables. All results were compared with those obtained by the standard method of germination: Seed contained in petri dishes on a filter paper substratum, germinated in a Hearson seed incubator at 30° C.

No significant difference in percentage germination was produced by:—

(i) Pre-drying at low temperatures (72 hours at 30–40° C.) before germination.
(ii) Pre-chilling at 0° C. before germination.
(iii) Germination at room temperature 18–30° C.
(iv) Germination on a soil substratum.
(v) Germination in a weak solution of Potassium nitrate.

Highly significant increases in percentage germination were obtained by:—

(i) Pre-drying at high temperatures 85–95° C. for 4 hours and 90–105° C. for 8 hours.
(ii) Planting in soil kept indoors at room temperature 18–30° C.
(iii) Slight scarification, consisting in the removal of the beak (pedicel) and extreme tip at the beak end of the seed coat.
(iv) Severe scarification of the entire seed coat.
(v) Pre-treatment in concentrated H_2SO_4 for 3 minutes, 10 minutes and 15 minutes.
(vi) Subjecting the germinating seed to strong sunlight.

E. 833, SEASON 1938–39 SEED.

COLLECTED 23.11.38, TESTS BEGAN 6.12.38.

Treatment.	Average. Germination.
	%
(1) Standard procedure, 30° C. in Hearson	1·0
(2) Pre-drying at 85–95° C. for 4 hours	6·2
(3) Seed planted in soil	6·5
(4) Slight scarification	5·0
(5) Severe scarification	11·0
(6) Germination in sunlight	3·0

E. 872, SEASON 1939–40 SEED.

COLLECTED 8.12.39, TESTS BEGAN 16.2.40.

Treatment.	Average Germination.
	%
(1) Standard procedure 30° C. in Hearson	10·2
(2) Pre-drying at 90–105° C. for 8 hrs.	19·2
(3) Conc. H_2SO_4 for 3 minutes	16·8
(4) Conc. H_2SO_4 for 10 minutes	23·8
(5) Conc. H_2SO_4 for 15 minutes	27·7

The optimum temperature for the germination of *Themeda triandra* seed appears to be less than 30° C. The highest percentage germinations were obtained at temperatures between 15° C. and 30° C. At 40° C. the percentage germination was less than ⅓ of the figure obtained at 30° C.

II. *Hyparrhenia hirta.*

Hyparrhenia hirta around Estcourt and throughout the Draycott Plain is an important constituent of the grassland.

It dominates a widespread and important community which represents a very persistent stage in the secondary succession on old disturbances, abandoned cultivation etc. It is a constituent of the undisturbed veld into which, because of its very late growing season and deep rooting habits, it fits very well. On the Tabamhlope Plateau it occurs as a rare species, confined to the sheltered sides of ridges and the warm slopes of river valleys, and is never important except in limited localities. In typical undisturbed veld at Estcourt it is one of the most important grasses, contributing in some sites, 28·09 per cent. of the total (basal area) cover. On old disturbances or overgrazed veld its contribution is much higher. It has a very late growing season and usually does not begin to pipe until the Themeda seed is ripe. Phenological observations made during the 1938–39 season are typical.

Themeda began to flower between 11.10.38 and 20.10.38 and the seed was ripe early in December. *Hyparrhenia hirta* did not begin to pipe until 2.2.38 and was not flowering generally until 22.3.39. Seed was collected on 19.5.39 after the first frost.

Germination.—The seed is small and is produced in great abundance. A high proportion of the seed harvested is incapable of germination, consisting of glumes without caryopses.

Because the seed is small, in counting out seed for a germination test, it is practically impossible to determine whether the glumes carry a caryopsis or not. This must be borne in mind when considering germination figures. Low percentage germination is offset by the great abundance of seed.

As in Themeda, the dormancy of fresh seed is marked, the average germination being about 1 per cent., but seed kept over winter germinates well (10 per cent.), during the following season.

No investigation of the optimum temperature for germination has yet been made, but higher germination percentages have always been obtained at 30° C. in an incubator than at room temperature, and it appears that the optimum for *Hyparrhenia hirta* is higher than for *Themeda triandra.*

III. *Tristachya hispida.*

Throughout the area *Tristachya hispida* is an important constituent of the undisturbed veld. At Tabamhlope it is the third most important species, contributing 11 per cent. of the total (basal) cover. At Estcourt it is often dominant, contributing 30·5 per cent of the total (basal) cover. It begins to grow at the same time as *Themeda triandra* and the two species flower together.

The seeds are large, 1,000 seeds (grain plus valve and pale) weighing 4·9147 grammes.

Germination.—Fresh seeds exhibit marked dormancy but the germination is high after a period of after-ripening.

Seed.	Collected.	Tested.	Percentage Germination.
E. 748...........	11.2.38	25.3.38	11·1
E. 748...........	11.2.38	10.1.40	72·4
E. 880...........	8.12.39	10.1.40	18·3

IV. *Trachypogon capensis.*

Trachypogon capensis is a characteristic grass of undisturbed veld. It is a delicately adjusted species and disappears rapidly if the pressure on the sward is high.

On the Draycott Plain it is widely distributed in undisturbed veld but is nowhere an important contributor to the cover.

On the Tabamhlope Plateau and on the Little Berg, however, it becomes an important grass, contributing 8·9 per cent. of the total (basal) cover.

Trachypogon is a late season grass, flowering together with *Monocymbium ceresiiforme* after the Themeda has set seed. Flowering usually begins in March.

The effect of burning, mowing or grazing on the flowering of Trachypogon is most marked. A fire in November or December will entirely prohibit flowering, although under the same conditions Monocymbium will flower readily (See Photograph 24). Mowing through the growing season prevents Trachypogon from flowering though Monocymbium may flower. Much of the seed produced is incapable of germination.

Seed.	Collected.	Tested.	Percentage Germination.
E. 777...........	13.1.39	9.1.40	11%

Fresh seed has not been tested.

V. *Pioneer Grasses.*

(i) *Aristida* spp.

The germination of three typically pioneer *Aristida* spp. was investigated. These are:—

(1) *Aristida congesta.*

(2) *Aristida barbicollis.*

(3) *Aristida curvata.*

Aristida congesta and *A. barbicollis* are short lived perennials, while *A. curvata* is an annual species.

All are xerophytic grasses characteristic of the early and more extreme stages of the secondary succession and of overgrazed and eroded veld, on the Draycott Plain and in the Thornveld. The plants produce scanty foliage but an abundance of seeds. The seeds are light, with 3-partite awns, and are admirably fitted for dispersal by animals as they cling to hair and clothing and even penetrate the skin. Seeds are produced in great abundance during the latter half of the growing season.

Germination.—The dormancy of fresh seed is again evident. The following figures from tests at 30° C. show that the seed does not begin to germinate well, until it has gone through a period of after-ripening.

Aristida congesta.

E. 876...........	21.12.39	22.12.39	4·0
E. 876...........	21.12.39	28.10.41	62·7
E. 854...........	17.4.39	19.10.39	9·5
E. 769...........	9.4.38	6.5.38	0·0
E. 769...........	9.4.38	24.10.39	61·2

Aristida barbicollis.

E. 877...........	21.12.39	27.12.39	7·0
E. 770...........	9.4.38	7.5.38	0·0
E. 770...........	9.4.38	24.10.39	64·7
E. 770...........	9.4.38	19.4.40	70·3

Aristida curvata.

E. 859...........	17.4.39	18.10.39	74·0

The effect of temperature on germination is very marked.

Seed.	Collected.	Tested.	Temperature.	Percentage Germination.
		Aristida congesta.		
E. 876.........	21.12.39	22.12.39	30° C.	4·0
E. 876.........	21.12.39	22.12.39	Room temperature	6·5
E. 854.........	17.4.39	19.10.39	30° C.	9·5
E. 855.........	17.4.39	19.10.39	Room temperature	11·2
E. 769.........	9.4.28	6.5.38	25° C.	3·0
E. 769.........	9.4.38	6.5.38	30° C.	0·0
E. 769.........	9.4.38	24.10.38	30° C.	61·2
E. 769.........	9.4.38	24.10.38	Room temperature	81·5
		Aristida barbicollis.		
E. 770.........	9.4.38	6.5.38	25° C.	1·0
E. 770.........	9.4.38	6.5.38	30° C.	0·0
E. 770.........	9.4.38	24.10.39	30° C.	64·7
E. 770.........	9.4.38	24.10.39	Room temperature	82·0
E. 770.........	9.4.38	13.4.40	40° C.	48·2
E. 770.........	9.4.38	19.4.40	30° C.	70·3
E. 770.........	9.4.38	12.4.40	Alternating 30–40° C.,09.00—15.00 at 40° C., 15.00–09.00 at 30° C.	72·3

(ii) *Eragrostis* spp.

The *Eragrostis* spp. investigated were:—

Eragrostis curvula.
Eragrostis robusta.
Eragrostis chalcantha.

Eragrostis curvula and *E. robusta* are tall species (36–40 inches) characteristic of the latter stages of the secondary succession on ploughed lands at Estcourt and Tabamhlope.

Eragrostis chalcantha occurs throughout in undisturbed veld where it plays a very important role in colonising and healing minute disturbances.

The seed of all three is very small. It is produced in great abundance and the germination of the old seed is remarkably high. The flowering periods of these three species is a very extended one.

Seed.	Collected.	Tested.	Temperature.	Percentage Germination.
		Eragrostis curvula.		
E. 746.........	10.2.38	21.12.39	Room temperature	87·7
E. 746.........	10.2.38	20.12.39	30° C.	96·0
E. 746.........	10.2.38	13.4.40	40° C.	90·7
E. 746.........	10.2.38	12.4.40	Alternating 30°–40° C.	93·8
E. 746.........	10.2.38	19.4.40	30° C.	96·0
		Eragrostis robusta.		
E. 494.........	17.4.37	21.12.39	Room temperature	87·0
E. 494.........	17.4.37	21.12.39	30° C.	89·0
		Eragrostis chalcantha.		
E. 743.........	10.2.38	21.12.39	Room temperature	85·7
E. 743.........	10.2.38	21.12.39	30° C.	84·5

(iii) *Sporobolus pyramidalis.*

Sporobolus pyramidalis is a tall grass characteristic of the latter stages of secondary succession at Estcourt. It is associated with tall *Eragrostis* spp., such as *Eragrostis curvula* and *Eragrostis plana.*

As in the *Eragrostis* spp., the seed is small and produced in great abundance (1,000 seeds weigh 0·1885 grammes).

Seed.	Collected.	Tested.	Temperature.	Percentage Germination.
E. 858.........	17.4.39	7.5.39	25° C.	1·0
E. 858.........	17.4.39	7.5.39	30° C.	0·0
E. 858.........	17.4.39	18.10.39	Room temperature	28·0
E. 858.........	17.4.39	18.10.39	30° C.	54·5
E. 768.........	9.4.38	24.10.39	Room temperature	77·8
E. 768.........	9.4.38	24.10.39	30° C.	90·5
E. 768.........	9.4.38	12.4.40	30° C.	94·2
E. 768.........	9.4.38	12.4.40	40° C.	85·8
E. 768.........	9.4.38	12.4.40	Alternating 30°–40° C., 16.30–08.30 at 30° C., 08.30–16.30 at 40° C.	94·5

In contrast to the results obtained for *Themeda triandra, Aristida congesta* and *A. barbicollis,* the germination of *Eragrostis* spp. and of *Sporobolus pyramidalis* was not adversey affected by temperatures as high as 30° C., and in the case of *Eragrostis curvula* and *Sporobolus pyramidalis,* excellent germination was obtained at 40° C.

CHAPTER XI.

THE ANIMAL ASSOCIATES.

" . . . In nature there is no community other than *biotic* wherein plants and animals behave as interdependent, coacting members of an integrated social organism." (Phillips 1930; 4.)

Plants with which this account is principally concerned are fixed and form the skeleton or framework of the biotic community.

Lack of time and opportunity have rendered impossible a study of the animal associates and of the coactions between animals and plants in Weenen County and in this chapter only those animal associates which have for various reasons attracted the writer's attention are mentioned, and many important orders and families of animals, particularly invertebrate animals, have not been studied at all.

1. Mammals.

Game is preserved in the Giant's Castle Game Reserve at the source of the Bushman's River, in the Drakensberg National Park at the source of the Tugela, on Crownland on the Drakensberg and on private land by many farmers.

Order Primates.

Baboons (*Papio porcarius* Bodd.) still occur in troops in the broken hilly country of the Little Berg and on the Drakensberg itself. They feed on roots, fruits and small animals, which they obtain by turning stones over. They have been found feeding on the ripe female cones of *Encephalartos ghellenkii.*

Monkeys are rare. They may occur in the Thornveld valleys, but have never been observed by the writer.

Order Rodentia.

Hares are common throughout the region. Some specimens shot at Estcourt were identified by Dr. Hewitt as *Lepus zuluensis* Thos. and Schwn. Other species occur. A Red Hare (*Pronolagus* sp.) has been noticed in the mountains.

Porcupines (*Hystrix africae-australis* Ptrs.) occur throughout.

Cane Rats (*Thryonomys swinderenianus variegatus* Ptrs.) occur on the banks of the Bushman's River near Estcourt.

Springhares do not occur.

The Mole Rat (*Cryptomys hottentotus* Less) is common, and its hills are often conspicuous in grassland. It is sometimes responsible for the formation of hummocks in the Sedge Meadow stage of the hydrosere (page 94).

Rats and Mice become very numerous in grassland protected from burning. They consume large quantities of grass seed and, by burrowing and establishing runways, disturb the vegetation considerably. Very common are Field Mice (*Leggada minutoides* Smith), the Multimammate Rat [*Rattus* (*Mastomys*) *colonus* Brants.] and Chaka's Striped-mouse (*Rhabdomys pumilio chakae* Wrghtn.).

Order Insectivora.

Shrews are widely distributed. *Crocidura* spp. have been collected in the Drakensberg on Champagne Castle Peak at an altitude over 7,000 feet, and at the Tabamhlope Research Station.

A termite Shrew (*Suncus* sp.) was collected at Estcourt.

A brown Meerkat (mongoose) is common in open grassland. This species is colonal making burrows in open veld. The warrens are characterised by a secondary community in which *Solanum* sp. is often conspicuous.

Order Ungulata.

Many of the larger mammals have been exterminated, while the rest have been greatly reduced in numbers.

The Duiker (*Sylvicapra grimmi*) is widely distributed.

The Klipspringer (*Oreotragus oreotragus*) is rare, occurring only in the mountains.

The Oribi (*Ourebia ourebi*) occurs in grassveld on farms where it is protected.

The Rooi Rhebuck (*Redunca redunca fulvorufula*) is fairly common in grassveld on farms where it is preserved, and in the Little Berg and Drakensberg region.

The Vaal Rhebuck (*Pelea capreolus*) is less common. It occurs in grassland in the Little Berg and in the Drakensberg.

The Reedbuck (*Redunca eleotragus arundinum*) is to be seen occasionally in vleis and river beds on the Tabamhlope Plateau and in the mountains.

Bushbuck (*Tragelaphus scriptus sylvaticus*) occurs in patches of forest and on some farms in the Thornveld.

Small herds of Blesbok (*Damiliscus albifrons*) introduced from the Free State occur in a semi-domesticated condition on some grassveld farms.

Eland (*Tauro-tragus oryx*) preserved in the Giant's Castle Game reserve, range along the slopes of the Drakensberg and in winter descend to some of the farms in the Little Berg.

Rock Dassies (*Procavia capensis*) are common on krantzes and rocky slopes throughout.

2. Reptiles.

Lizards are very common, particularly in the Thornveld. Most South African snakes occur, including occasional python in the Thornveld. Many of the snakes devour rodents.

An interesting record is *Leptotyphlops conjuncta*, a very small snake common in grassveld at Estcourt.

3. Amphibians.

The Striped Grass Frog (*Rana fasciata*) and Gray's Grass Frog (*Rana grayi*) are very abundant in grassveld on the Tabamhlope Plateau, and numbers are injured by the mowing machines during hay making. At Estcourt, where conditions are much drier, frogs are not common in grassland.

4. Insects.

(1) Ants.—Three species of ants take part in the building of hummocks in the Sedge Meadow Stage of the hydrosere (vleis) See Page 118. These have been collected but are not named. One is a species of *Camponotus*.

(2) Termites.— The fact that bush clumps often form around termite mounds is mentioned by Bews (1912), Fuller (1913), Aitken (1922) and Bayer (1938). Gilliland (1938) in Rhodesian Manicaland, elaborates this observation by suggesting the following probable sequence of events:—

(i) The establishment of a termitary.

(ii) An attack on the termitary by an Ant Bear.

(iii) The invasion of the ant bear hole by a tall growing shade producing herb or fern.

Murray (1938) discusses the interrelationships of the vegetation, soil and termites in grassveld.

Termite mounds are very common in the Thornveld, and in grassveld, on the Draycott Plain. At higher altitudes they are rare.

Macrotermes natalensis Haviland and *Termes latericius* Haviland are, as Fuller mentions, the two species principally responsible for the mounds around which bush clumps form. Both species are fungus growers.

Macrotermes natalensis, on the Draycott Plain, constructs large mounds which may be as much as five feet tall and correspondingly broad at the base. (See Photograph 34.) Fuller noticed these mounds at Winterton and remarks on their unusual height. In " Bush Clumps " this termite inhabits great ramparts described by Fuller as Nest sites, which are of very ancient formation and owe their bulk to the work of generations of termites and the accumulation of organic matter from the trees which overgrow them.

Termes latericius constructs a wide low mound, studded at intervals by apertures, which are the openings of air pits. (See Photograph 35). Often the mounds are only slightly elevated above the ground level. They may be from 10 to 20 feet in diameter.

Macrotermes natalensis and *Termes latericius* feed on dung and grass. The latter harvests green grass and stores grass seeds.

They assist the succession in ecotonal grassveld by reducing the grass competition and by creating bare areas in which invading semi-deciduous bush species are protected from fire.

Trinervitermes havilandii Fuller is another species whose mounds are very conspicuous in grassveld on the Draycott Plain. Their symmetrical, half-spherical mounds often stud very closely, considerable areas of grassland. They cut and gather grass and green grass seed, but do not cause the large bare areas which are often so marked a feature of the nests of *Termes latericius.* Two agarics are often found growing out of their mounds, *Podaxon pistillaris* and *P. carsinomalis.*

Hodotermes havilandii, a harvesting termite, is common in Thornveld river valleys. *Microtermes incertus,* a fungus grower, is recorded and has a similar distribution.

(3) Species of *Bruchidae* (two species) parasitise the seeds of *Acacia woodii.*

(4) Species of *Lamiidae* (two species) parasitise the seeds of *Acacia karroo* and *A. arabica.*

13.9.39	No. of pods examined.	Sound Seed.	Parasitised Seed.
Acacia karroo................	100	451	156
A. arabica....................	100	793	119
A. woodii.....................	100	499	421

5. Earthworms.

Earthworms are remarkably abundant in the wet soil of the Sedge Meadow Stage of the hydrosere in the vlei at Tabamhlope. The part they play in raising the general level of the soil is discussed on page 94.

At least two species are common, and their abundance can be gauged from the fact that 74 individuals were removed from the top nine inches in a square metre quadrat. This count was made during August 1939. The water table at that time was at 9 inches and the soil from that depth to within $\frac{1}{2}$ inch of the surface was wet. The pH of these vlei soils is about 4·97.

The abundance of earthworms in these water-logged, acid soils does not confirm Phillip's observations on the indicator value of earthworms (Phillips 1931; p. 35).

It has not been possible yet to have these Oligochaetes named, but specimens have been sent to the British Museum.

Very large earthworms, which cover the surface of the ground with large, hard casts, are common in grassveld on the hillsides on the Tabamhlope Plateau. These may be *Chelota warreni* Michlsn., recorded by Michaelson (1913) between Pietermaritzburg and Greytown and from the Game Pass in the Drakensberg. *Microchaetus invari Mich.,* is recorded from Estcourt.

6. Birds.

Family.	No. of species.	Habitat.	Food.
1. Podicipidae.......... *Grebes*	1	Water.............	Small water animals.
2. Phalacrocoracidae..... *Cormorants*	2	Water.............	Fish.
3. Ardeidae............. *Herons*	7	Water, marsh and grassland	Insects, fish, small mammals, etc. fledgelings.
4. Scopidae............. *Paddavanger*	1	Water, marsh, etc...	Frogs, fish and small animals.
5. Ciconiidae........... *Storks*	3	Water, marsh, grassland, bush and cultivated fields.	Frogs, water animals, large insects, etc.
6. Threskiornithidae..... *Ibises*	3	Shallow water, marsh, grassland, bush, forest margins	Insects, small animals frogs and small water animals.
7. Plataleidae........... *Spoonbills*	1	Water............	Small water animals.
8. Anatidae..... ...... *Ducks and Geese*	5	Water, marsh, grassland, fields, etc.	Small water animals, herbage, roots, bulbs, corms, grain, etc.
9. Saggitariidae......... *Secretary bird*	1	Grassland, open bush	Snakes, lizards, tortoises, fledgelings, small mammals, etc.
10. Aegypiidae........... *Vultures*	2	Kolbe's vulture breeds on ledges on precipices in the Berg and on Tabamhlope Mountain, etc. The Black Vulture nests in trees.	Carrion.
11. Falconidae........... *Hawks and Eagles*	12	Marsh, grassland, bush, forest and the Drakensburg	Insects, frogs, reptiles, birds, small mammals and carrion.
12. Phasionidae.......... *Game birds*	5	Grassland, bush, forest, cultivated fields	Bulbs, corms, seeds, grain, insects, etc.
13. Numididae........... *Guinea Fowl*	1	Grassland, bush and cultivated fields	Bulbs, corms, seeds, grain, insects, etc.
14. Turnicidae........... *Button Quail*	1	Grassland..........	Insects and small grain.
15. Rallidae............. *Rails, Coots, etc.*	6	Water, marsh and grassland	Insects, small animals and herbage.
16. Gruidae............. *Cranes*	3	Marsh, grassland and cultivated fields	Insects, small animals, grain and vegetation.
17. Otidae.............. *Bustards*	4	Grassland and bush	Large insects, and other small animals, herbage.
18. Charadriidae......... *Plovers*	3	Water, marsh, grassland and bush.	Small water animals, insects, etc.
19. Scolopacidae......... *Snipes, Sandpipers*	4	Water and marsh...	Worms, insects and other small animals.
20. Burhinidae........... *Dikkop*	1	Open bush.........	Insects and other small animals.
21. Glareolidae.......... *Coursers, Prantincoles*	2	Grassland, edge of forest.	Locusts and other insects.
22. Columbidae.......... *Doves and Pigeons*	7	Bush, forest, plantations, krantzes.	Seeds and berries.

Family.	No. of species.	Habitat.	Food.
23. Cuculidae............ *Cuckoos and Coucals*	6	Bush, forest and plantations.	Caterpillars, insects, etc. The Coucal consumes small birds, lizards, rodents, etc.
24. Tytonidae............ *Barn Owls*	1	Often nests in buildings.	Mainly small rodents.
25. Bubonidae............ *Marsh and Eagle Owls*	2	Marsh, grassland, bush and hilly open country.	Small birds, rodents, hares, etc.
26. Caprimulgidae........ *Night Jars*	2	Bush..............	Insects.
27. Micropodidae........ *Swifts*	3	Aerial ; favour open grassland and precipitous mountain areas.	
28. Coliidae............. *Mouse Birds*	2	Bush..............	Herbage, fruit and berries.
29. Alcedinidae.......... *Kingfishers*	4	Open water, streams and bush. (The Brownhooded Kingfisher does not dive for fish, but subsists on insects, etc., picked up under trees.)	Fish, insects, etc.
30. Coraciidae........... *Rollers*	1	Bush..............	Insects.
31. Upupidae............ *Hoopoes.*	3	Bush, plantations, etc.	Insects.
32. Bucerotidae.......... *Hornbills*	3	Open grassland, bush and forest.	Fruit and insects and other small animals
33. Capitonidae.......... *Barbets*	3	Bush..............	Berries, fruit and insects.
34. Picidae.............. *Woodpeckers*	4	Bush and forest....	Insects.
35. Jyngidae............. *Wryneck*	1	Bush..............	Insects.
36. Alaudidae............ *Larks*	2	Grassland, open stretches in bush.	Seeds, insects.
37. Hirundinidae......... *Swallows*	8	Aerial, marsh, grassland, bush and forest.	Insects.
38. Campephagidae....... *Cuckoo Shrikes*	1	Bush..............	Insects.
39. Dicruridae........... *Drongo*	1	Bush, plantations and forest.	Insects.
40. Oriolidae............ *Oriole*	1	Bush and forest....	Insects, fruit.
41. Corvidae............. *Crows*	3	Grassland, bush, forest, Drakensberg and cultivated fields.	Grain, insects, small animals, eggs, carrion.
42. Timaliidae........... *Babblers and Rock Jumpers*	2	Bush and Drakensberg.	Insects.
43. Pycnonotidae......... *Bulbuls*	2		Herbage, fruitnda insects.
44. Turdidae............. *Thrushes, Chats and Robins.*	14		Insects, worms, snails, berries, fruit.

Family.	No. of species.	Habitat.	Food.
45. Sylviidae............. *Warblers*	6	Marsh, grassland, bush and forest.	Insects.
46. Priniidae............. *Wren Warblers*	1	Bush along streams, forest margins.	Insects.
47. Muscicapidae......... *Flycatchers*	8	Bush and forest....	Insects.
48. Motacillidae.......... *Wagtails, Pipits, and Longclaws*		Water, marsh and grassland.	Insects.
49. Laniidae............. *Shrikes*	7	Grassland, bush and forest.	Insects, lizards, small birds and animals.
50. Sturnidae............ *Starlings*	5	Grassland, bush and forest.	Insects, fruit.
51. Buphagidae.......... *Oxpeckers*	1	Bush..............	Ticks on animals.
52. Nectariniidae......... *Sunbirds*	6	Bush and forest; Protea open woodland on Mountain sides.	Nectar and insects.
53. Zosteropidae......... *White Eyes.*	1	Bush and forest....	Nectar and fruit.
54. Ploceidae............ *Weavers, Sparrows, Bishop Birds, Widow Birds, Finches, Waxbills, Canaries, Buntings, etc.*	29	Marsh, grassland, bush and forest.	Seeds and grain.

CHAPTER XII.

THE FLOWERING PLANTS OF WEENEN COUNTY.

A Preliminary Check List with Notes on the Distribution and Ecology of the Species.

Because there are no published lists of the Flora of Weenen County, this list has been compiled principally from collections made in Weenen County by the writer and by Mr. John Acocks of the Division of Botany and Plant Pathology.

The list contains the names of a few plants recorded by Bews (1921) and by Henkel (1934) from localities within the county, and of plants collected in Weenen County by Wood, Evans, E. A. Schelpe, Hutchinson and a few other collectors. Many plants listed by Bews for the Drakensberg, Mont-aux-sources etc., are not included, because it was found that a great number of these plants had been collected outside the boundaries of Weenen County, in the Orange Free State or in Basutoland.

It is realised that the list is by no means complete and that it will undoubtedly be lengthened by further collecting, but it contains the names of many plants not previously recorded for Natal in any published lists, and of several plants which cannot be matched in Herbaria, and are presumably new species.

In considering the floristic data, which is presented in tabular form hereunder, allowance must be made for the fact that in no instance can the lists from which the data are compiled be regarded as complete, least of all in Weenen County, where relatively few collections have been made. Because of the incompleteness of distribution records, the great differences in the dates of publication of the different lists and differences in the species concept, the figures given can only be regarded as approximate.

FIGURES OF PHANEROGAMS FROM DIFFERENT AREAS IN SOUTH AFRICA.

	Area in sq. miles.	Families.	Genera.	Species.
South Western Region of the Cape (Bolus 1905)	35,000	110	705	5,585
Cape Peninsula (Muir 1929)..........	197	93	485	2,117
Riversdale, Cape (Muir 1929).........	1,711	121	646	2,294
George, Knysna and Humansdorp (Phillips, J. F. V., 1931)	6,000	119	613	2,185
Uitenhage and Port Elizabeth (Schonland 1919)	4,000	129	716	2,312
Albany and Bathurst (Dyer, 1937)......	2,300	119	647	2,084
Springbok Flats, Tvl. (Galpin, 1926)...	4,550	84	203	584
Natal and Zululand (Ex. Muir, 1929, from Bews, 1921)	29,000	148	901	3,786
Weenen County (Estcourt and Weenen)	2,332	112	559	1,584

DETAILED FIGURES FOR WEENEN COUNTY
(approximate).

	Species.	Genera.	Families.
Gymnosperms	4	3	3
Monocotyledons	457	151	16
Dicotyledons	1,123	405	93
Totals	1,584	559	112

THE FAMILIES IN ORDER OF NUMERICAL IMPORTANCE IN WEENEN COUNTRY.

	Genera.	Species and Varieties.
Compositae	68	242
Gramineae	66	198
Leguminosae	34	116
Liliaceae	25	74
Cyperaceae	13	65
Scrophulariaceae	25	59
Asclepiadaceae	15	49
Euphorbiaceae	13	39
Orchidaceae	14	34
Labiatae	13	32
Iridaceae	10	32
Rubiaceae	15	30
Amaryllidaceae	11	26
Acanthaceae	12	24
Campanulaceae	4	23
Crassulaceae	3	21
Umbelliferae	10	20
Malvaceae	7	19
Polygalaceae	2	19
Geraniaceae	3	17
Anacardiaceae	3	17
Solanaceae	6	15
Rosaceae	5	15
Convolvulaceae	5	15
Sterculiaceae	3	14
Gentianaceae	3	14
Ericaceae	2	14
Caryophyllaceae	8	13
Cruciferae	10	12
Amarantaceae	8	12
Verbenaceae	6	12
Santalaceae	3	12
Thymelaeaceae	3	12
Polygonaceae	2	12
Borraginaceae	6	11
Celastraceae	3	11
Aizoaceae	3	10
Flacourtiaceae	4	9
Juncaceae	2	9
Cucurbitaceae	5	8
Onagraceae	3	8
Oleaceae	3	7
Chenopodiaceae	1	7

	Genera.	Species and Varieties.
Rhamnaceae	5	6
Rutaceae	4	5
Ranunculaceae	3	5
Capparidaceae	3	6
Tiliaceae	3	5
Vitaceae	2	6
Ebenaceae	2	6
Dipsaceae	2	6
Dioscoreaceae	1	5
Moraceae	1	6
Phytolaccaceae	3	4
Icacinaceae	3	4
Sapindaceae	3	4
Commelinaceae	2	4
Loranthaceae	2	4
Proteaceae	1	4
Plantaginaceae	1	4
Melianthaceae	2	3
Apocynaceae	2	3
Urticaceae	2	2
Portulaceae	2	2
Papaveraceae	2	2
Fumariaceae	2	2
Meliaceae	2	2
Halorrhagidaceae	2	2
Myrsinaceae	2	2

The following families are represented by 3 species in 1 genus: *Guttiferae, Combretaceae, Araliaceae, Loganiaceae, Gesneriaceae.* The following families are represented by 2 species in 1 genus: *Taxaceae, Araceae, Xyridaceae, Velloziaceae, Piperaceae, Olacaceae, Malpighiaceae, Balsaminaceae, Begoniaceae, Burseraceae, Olinaceae, Primulaceae, Plumbaginaceae, Sapotaceae, Lentibulariaceae.* The following families are represented by 1 species in 1 genus: *Cycadaceae, Pinaceae, Typhaceae, Aponogetonaceae, Hydrocharitaceae, Restionaceae, Salicaceae, Myricaceae, Ulmaceae, Nyctaginaceae, Menispermaceae, Lauraceae, Resedaceae, Podostemonaceae, Pittosporaceae, Linaceae, Zygophyllaceae, Aquifoliaceae Ochnaceae, Lythraceae, Pedaliaceae, Valerianaceae.*

(NOTE.—The following abbreviations are used for the names of collectors:—

A. & H. for Acocks and Hafstrom.

E. A. S. for E. A. Schelpe.

Hutch. for J. Hutchinson.

J. A. for J. Acocks.

J. A. P. for J. A. Pentz.

O. W. for O. West.

W. W. & A. for West, Wright and Acocks.)

The arrangement of families and genera follows the order given in "The Genera of South African Flowering Plants" by E. P. Phillips, 1926.

CYCADALES.

CYCADACEAE.

Encephalartos ghellinckii Lem. Locally abundant in Macchia on slopes of Champagne Castle Peak; at foot of Cave Sandstone on farm Solitude in the Little Berg and in Tugela Gorge, Drakensberg National Park. Hutch. 4536.

CONIFERAE.

TAXACEAE.

Podocarpus falcatus (Thunb.) R. Br. Occasional in mountain forest near Tabamhlope Pasture Station; in forest on Umhlumba Mountain and on the Oribi Flats between Middle Rest and Mooi River. O.W. 1091.

P. latifolius (Thunb.) R. Br. Often dominant in mountain forest. O.W. 87, 158.

PINACEAE.

Widdringtonia dracomontana Stapf. Small tree forming consocies at upper limits of forest on the Little Berg. O.W. 1.

MONOCOTYLEDONEAE.

TYPHACEAE.

Typha capensis Rohrb. Locally abundant in vleis. Reed swamp stage of the hydrosere. O.W. 1578.

APONOGETONACEAE.

Aponogeton spathaceum D. Mey. Abundant in vleis. Sedge meadow stage of the hydrosere. O.W. 654, 843.

HYDROCHARITACEAE.

Lagarosiphon muscoides Harv. Locally abundant in vleis and slow streams. An aquatic herb of the hydrosere. O.W. 900.

GRAMINEAE.

Imperata cylindrica (L.) Beauv. Locally frequent to locally very abundant in moist sites in grassland. Flowers midsummer. J.A. 10058.

Miscanthidium capense (Nees) Stapf. Occasional on banks of Bushman's River near Estcourt. Flowers late summer. Inflorescence 6 ft.–8 ft. tall. O.W. 1796.

M. capense var. **villosum** (Stapf) Phill. Locally abundant in moist sites on the Tabamhlope Plateau. O.W. 1119, 1152.

M. sorghum (Nees) Stapf. Marshy places. Locally frequent to locally very abundant along streams and in marshy places on the Little Berg. Flowers late summer. Inflorescence 6 ft.–8 ft. tall. O.W. 130.

Eulalia villosa (Thunb.) Nees. Occasional in undisturbed veld on Tabamhlope Plateau and Little Berg. O.W. 1267, 1589, 1423.

Ischaemum arcuatum (Nees) Stapf. Locally abundant in stream beds in the Thornveld. O.W. 1774.

I. sp. probably **I. brachyatherum** (Hochst.) Fenzl. Occasional in grassland on mountain sides on the Little Berg. O.W. 145.

I. franksae J. M. Wood. Type gathering (J. M. Wood 10540) on Tabamhlope Mountain at 6,000 ft. on 26/10/1907. It has been collected only once since by Col. A. Weebold (Nat. Herb. 15729) near Champagne Castle in October 1933 at 5,300 ft.

I. purpurascens Stapf. Locally abundant in stream beds in the Thornveld. J.A.P. 138.

Hemarthria altissima (Poir.) Stapf & Hubb. Locally very abundant in sedge meadow stage of the hydrosere, and in moist sites in grassland, streambeds, etc. O.W. 239, 588.

Trachypogon capensis (Thunb.) Trin. Occasional to abundant in undisturbed veld. Rare at low altitudes in the Thornveld. Sometimes very abundant in the mountains. Flowers late summer. O.W. 46, 47, 700, 735, 792, 1048, 1808.

Elyonurus argenteus Nees. Occasional to frequent in undisturbed veld. Flowers in spring. O.W. 683, 460.

E. glaber Phillips var. **villosus** Phillips. Occasional in Thornveld. O.W. 714.

Andropogon amplectens Nees. Occasional in undisturbed veld. Flowers late summer. O.W. 697, 732.

A. sp. near **A. amplectens.** Alpine grassland. Collected on Bushman's Pass at 7,000 ft.

A. appendiculatus Nees. Occasional to very abundant in moist sites. Occasional in undisturbed veld. O.W. 236, 784, 13, 1471.

A. appendiculatus Nees var. Collected in undisturbed veld on the summit of Tabamhlope Mountain. O.W. 600.

A. eucomis Nees. Occasional in disturbances and moist sites. O.W. 253, 267, 1601.

A. filifolius Steud. Abundant in undisturbed veld on the Tabamhlope Plateau. O.W. 782, 470, 917.

A. schirensis Hochst. var. **angustifolius** Stapf. Occasional in shallow soil over rock, Tabamhlope Mountain, and in Thornveld. O.W. 1054, 1781, 1799.

Sorghum versicolor Anders. Locally abundant in cultivated fields near Colenso. O.W. 1809.

Bothriochloa glabra (Roxb.) A. Camus. Locally abundant in moist sites in Thornveld on farm Schurfdepoort near Colenso. O.W. 1810.

B. insculpta (Hochst. ex A. Rich.) A. Camus. Abundant in Thornveld. O.W. 245, 1544.

Cymbopogon excavatus (Hochst.) Stapf. Locally abundant on rock outcrops in undisturbed veld. O.W. 744, 1776.

C. marginatus Stapf. Very abundant in mesocline grassland and in Macchia seral to forest. O.W. 43, 777, 1014.

C. sp. near **C. marginatus** Stapf. Abundant on rock outcrops in undisturbed veld, Estcourt. O.W. 731.

C. plurinodis Stapf. Abundant in Thornveld. O.W. 1777, 1794.

C. validus Stapf. Locally abundant on rock outcrops on summit of Tabamhlope Mountain. O.W. 1047.

C. sp. near **C. validus** Stapf. Locally abundant at forest and bush margins. O.W. 4, 224.

Hyparrhenia aucta (Stapf) Stent. Roadsides and railway embankments, Estcourt. O.W. 119.

H. dregeana Stapf. Locally abundant on rock outcrops etc., at Estcourt. O.W. 765.

H. hirta (L.) Stapf. Very abundant in the undisturbed veld of the ecotonal grassland of the Draycott Plain, the margins of Thornveld. Dominant on very old disturbances in these areas. Flowers late summer. There are several distinct varieties of this species. O.W. 42, 1003, 1004.

H. tamba Anders. Abundant on river banks, Estcourt. A very tall grass up to 8 ft. tall. O.W. 241.

Monocymbium ceresiiforme (Nees) Stapf. Very abundant in undisturbed veld on Tabamhlope Plateau, especially in slightly moist sites. Flowers in late summer. O.W 699.

Heteropogon contortus (L.) P. Beauv. ex R. & S. Occasional to locally abundant in undisturbed veld. Flowers in spring. A very robust broad leaved variety occurs in the Thornveld. O.W. 687, 719, 720, 461.

Themeda triandra Forsk. Abundant to very abundant in undisturbed veld. Flowers in spring. Several varieties occur. A very distinct, tall (to 5 ft.) yellow stemmed variety is confined to the Thornveld. O.W. 52, 680, 718, 794.

Tragus berteronianus Schult. A common pioneer on disturbances, denuded or eroded areas in the Thornveld and ecotonal grassland. O. W. 1760.

T. racemosus (L.) All. A common pioneer on disturbances, denuded and eroded areas in the Thornveld and ecotonal grassland. O.W. 1760.

Arundinella ecklonii Nees. Abundant in vleis, sedge meadow stage of hydrosere. Locally abundant in moist sites. O.W. 40, 48, 49, 698, 1153.

Melinis macrochaeta Stapf et Hubb. On a krantz, dry northern aspect, near Dalton Bridge. O.W. 1013.

Paspalum dilatatum Poir. Frequent in moist sites, stream banks, abadoned cultivation etc. A widely distributed alien. O.W. 234.

P. distichum Linn. Frequent in moist sites, boggy patches, etc. O.W. 1758.

P. scrobiculatum Linn. A weed of cultivation. Common. O.W. 1523.

Alloteropsis semialata (R. Br.) Hitch. var. **ecklonii** Stapf. Occasional to frequent in undisturbed veld, particularly on the Tabamhlope Plateau. O.W. 681, 458.

Panicum aequinerve Nees. In kloofs in the Little Berg, in shade. O.W. 144.

P. coloratum Linn. A stoloniferous grass, very important in the Thornveld. O.W. 1751.

P. coloratum Linn. var. A very robust form from the banks of the Tugela, Weenen District. O.W. 1747.

P. deustum Thunb. A tall grass, locally abundant in kloofs and on banks of watercourses in Thornveld. Usually in light shade. O.W. 240.

P. ecklonii Nees. Occasional in undisturbed veld, Tabamhlope. O.W. 465.

P. laevifolium Hack. An annual weed, abundant in cultivated fields at Tabamhlope during late summer. O.W. 729, 1768.

P. maximum Jacq. Locally abundant in the Thornveld. O.W. 1543.

P. natalense Hochst. Occasional in undisturbed veld, Giant's Castle Game Reserve, at 7,000 ft. O.W. 1615.

P. obscurans Stapf. Annual in eroded Thornveld. J.A. 9947.

P. sp. Hillside at New Formosa. J.A. 10231.

Urochloa panicoides P. Beauv. A common annual in cultivated fields, Estcourt. O.W. 230.

U. sp. An important stoloniferous grass in the Thornveld. O.W. 1754.

Brachiaria eruciformis (Sibth. & Smith) Griseb. (= B. isachne (Roth.) Stapf. A weed on paths and an important pioneer on " skoffled " patches and other disturbances at Estcourt. O.W. 678, 1527.

B. serrata (Spreng.) Stapf. Occasional to frequent in undisturbed veld. O.W. 688, 467, 660.

Echinochloa colona (L.) Link. Moist sites, Estcourt. O.W. 1770.

E. crusgalli (L.) Beauv. Along streams in Thornveld. J.A. 10828.

E. crus-pavonis (H.B.K.) Schult. Occasional in vleis in the sedge meadow stage of the hydrosere. O.W. 695.

Digitaria adscendens (Kunth) Henrard (= D. marginata Link.). Annual. Abundant in cultivated fields at Tabamhlope. O.W. 728.

D. diagonalis (Nees) Stapf. Frequent in mesocline grassland seral to forest. O.W. 701, 1035.

D. horizontalis Willd. Common weed in cultivated fields.

D. monodactyla (Nees) Stapf. Occasional to locally abundant in undisturbed veld. Locally abundant in shallow soil over rock. O.W. 741, 643.

D. sanguinalis (L.) Scop. Common weed in cultivated fields, Estcourt. O.W. 1842.

D. setifolia Stapf. Occasional in undisturbed veld at Tabamhlope. O.W. 590, 1411.

D. ternata (Hochst.) Stapf. Cultivated fields, disturbances, etc., in Thornveld. O.W. 211.

D. tricholaenoides Stapf. Occasional to locally abundant in undisturbed veld at Tabamhlope. O.W. 466.

D. sp. probably **D. natalensis** Stent. Thornveld, at Estcourt. O.W. 244.

D. sp. not matched in Natal Herbarium. Jones Kloof, Estcourt, locally very abundant making pure stands. Not stoloniferous. O.W. 1542.

D. sp. Common on krantz, Dalton Bridge. Not stoloniferous. O.W. 1032, 1499.

Rhynchelytrum repens (Willd.) Hubb. Common weed in cultivated fields and disturbances. O.W. 2, 231.

R. setifolia (Stapf) Chiov. Locally abundant on disturbed areas, overgrazed veld, etc. O.W. 147, 232, 690, 1780.

Oplismenus hirtellus (L.) Beauv. Constituent of the ground vegetation in forest. Abundant. O.W. 255.

Setaria flabellata Stapf. Occasional to frequent in undisturbed veld, Estcourt. O.W. 686.

S. nigrirostris (Nees) Dur. and Schinz. Frequent to locally abundant in undisturbed veld, Estcourt. O.W. 235, 698.

S. pallidifusca (Schum.) Stapf et Hubb. Ruderal, abundant in cultivated fields at Tabamhlope. O.W. 727.

S. sphacelata (Schum.) Stapf et Hubb. Moist sites, watercourses, etc., Estcourt. Locally abundant. O.W. 233.

S. verticillata (L.) Beauv. Disturbed areas and cultivated fields. Occasional. O.W. 1030.

S. woodii Hack. A Thornveld grass. J.A. 9969, 10158.

S. sp. Collected in the bed of Bushman's River, Estcourt. O.W. 1773.

Pennisetum natalense Stapf. River beds near Estcourt. J.A. 10122.

P. sphacelatum (Nees) Dur. and Schinz. Locally abundant in the sedge meadow stage of the hydrosere. Moist sites, river banks, etc. O.W. 592, 887, 1590.

P. thunbergii Kunth. Moist places. J.A. 10310.

P. thunbergii Kunth var. **galpinii** Stapf. Abundant in mesocline grassland at edge of forest on Tabamhlope Mountain. O.W. 1413.

P. villosum R. Br. A leafy perennial, apparently exotic, collected on Tom Bennet's farm near Winterton. O.W. 1354, 1755.

Beckeropsis uniseta (Nees) K. Schum. Common in river beds, on hillsides, etc. Edge of Thornveld.

Leersia hexandra Sw. Very abundant in vleis; grows in standing water. O.W. 115, 576.

Ehrharta longigluma C. E. Hubbard. Frequent in Alpine grassland, 7,200–9,000 ft. altitude. O.W. 1636, 1653.

E. panicea Sm. (= E. erecta Lam.). Common in shade of forest, sometimes epiphytic. O.W. 770, 1149.

E. panicea Sm. var. **natalensis** Stapf. Common in shade of forest and occurs in semi-deciduous bush at Estcourt. O.W. 1324, 1611, 1764.

Phalaris arundinacea Linn. Locally abundant in the sedge meadow stage of the hydrosere, moist sites, swampy places. O.W. 598, 886.

P. minor Retz. Ruderal, cultivated fields, Estcourt. O.W. 1520.

Anthoxanthum ecklonii (Nees) Stapf. Frequent in Alpine grassland, 7,200—9,000 ft. O.W. 1052, 1617, 1624, 1634, 1655, 1687, 1690, 1692.

A. odoratum Linn. A weed in cultivated land near Tabamhlope Mountain. O.W. 403.

Aristida barbicollis Trin. et Rupr. Frequent to locally abundant in overgrazed, denuded or eroded areas in the Thornveld and marginal grassland. O.W. 757, 1560.

A. bipartita (Nees) Trin. et Rupr. Occasional in undisturbed veld around Estcourt. Locally abundant on denuded and eroded areas in the Thornveld and marginal grassland. O.W. 684, 1534, 1558, 1771.

A. congesta R. & S. Frequent to locally abundant in overgrazed, denuded and eroded areas in the Thornveld and marginal grassland. O.W. 1557.

A. curvata (Nees) Trin. et Rupr. An annual. Locally abundant on overgrazed, denuded or eroded areas in Thornveld and marginal grassland.

A. diffusa Trin. var. **burkei** (Stapf.) Schweick. Locally abundant on stony hillsides in marginal Thornveld. O.W. 1778. 1779.

A. junciformis Trin. et Rupr. Locally abundant to locally very abundant in outer zones of sedge meadow stage of the hydrosere, probably indicating remote disturbance. Occasional in shallow soil over rock on Tabamhlope Plateau. O.W. 45, 593, 696, 1039, 1049, 1584.

A. monticola Henrard. Frequent in Alpine grassland, 7,200–9,000 ft. O.W. 1050, 1663.

A. scabrivalvis Hack. Locally abundant on eroded areas in the Thornveld. O.W. 1830.

Stipa dregeana Steud. A tall, leafy grass from upper edge of forest, Tabamhlope Mountain. O.W. 1605.

Sporobolus centrifugus Nees. Occasional to frequent in undisturbed veld at Tabamhlope and the Little Berg. O.W. 661, 1623.

S. centrifugus Nees var. **filifolius** (Stent) Goossens. Occasional in undisturbed veld, Tabamhlope. O.W. 1405.

S. centrifugus Nees var. **laxivaginatus** (Stent) Goossens. Occasional in undisturbed veld, Tabamhlope. O.W. 1495.

S. discosporus Nees. In patches of mossy soil on sandstone sheets, Fernhurst. J.A. 11368.

S. festivus Hochst. var. **fibrosus** Stapf. Occasional in shallow soil over rock, Estcourt. O.W. 713, 1583.

S. fimbriatus Nees var. **latifolius** Stent. A common grass in the Thornveld. Abundant in light shade. O.W. 243, 251.

S. pyramidalis Beauv. Very abundant in old ploughed areas and occasional in undisturbed grassland, Thornveld and marginal grassland. O.W. 745, 226, 1775.

S. schlechteri Schweick. Occasional in shallow soil, Estcourt. J.A. 10506.

S. smutsii Stent. Locally abundant on trampled areas in Thornveld. J.A. 9910.

S. stapfianus Gandoger. Occasional on stony hillsides, Thornveld and marginal grassland. O.W. 517, 1553.

Agrostis barbuligera Stapf. Frequent in Alpine grassland up to 9,000 ft. O.W. 1621, 1718, 1851.

A. bergiana Trin. A very slender and delicate grass, occasional in Alpine grassland. O.W. 1664.

A. eriantha Hack. Annual weed in cultivated pastures, Tabamhlope. J.A. 10036.

A. huttoniae Hubb. Along streams in grassland. J.A. 11412.

A. lachnantha Nees. Occasional throughout the area in moist sites. Common in Alpine grassland near water to 9,000 ft. O.W. 12, 361, 1323, 1627, 1656, 1657.

Calamagrostis huttoniae Hack. Locally abundant in sedge meadow stage of the hydrosere. O.W. 885.

Holcus lanatus Linn. Introduced. Moist sites near farm houses. O.W. 109.

Helictotrichon galpinii Schweick. Occasional in Alpine grassland. O.W. 1722.

H. capense Schweick. Wagon Drift, Estcourt. J.A. 10842.

H. hirtulum (Steud.) Schweick. Occasional in Thornveld, Estcourt. O.W. 1579.

H. longifolium (Nees) Schweick. Collected in undisturbed veld, rare. O.W. 1608.

H. natalense Schweick. Alongside stream in Thornveld. J.A. 10830.

H. turgidulum (Stapf.) Schweick. Frequent in Alpine grassland; occasional in undisturbed veld and mesocline grassland below forest at Tabamhlope; shady river banks, Estcourt. O.W. 567, 1322, 1415, 1509, 1625, 1629, 1691.

Tristachya hispida (L.f.) K. Schum. Abundant to locally very abundant in undisturbed veld, usually one of the dominant species. Flowers in spring. O.W. 468, 568, 679.

Loudetia simplex (Nees) Hubbard. Occasional in undisturbed veld at high altitudes.

Danthonia disticha Nees. Abundant in Alpine grassland. O.W. 798, 800, 1689, 1715.

D. drakensbergensis Schweick. Occasional to locally abundant on slopes to about 10,000 ft. O.W. 799, 1651, 1680.

D. macowanii Stapf. Mountain slopes and river banks. O.W. 790; J.A. 10659.

D. stricta Schrad. Occasional in summit grassland in shallow soil over rocks and on rock ledges. O.W. 612, 1053, 1408.

Pentaschistis angustifolia (Nees) Stapf var. **cirrhulosa** Stapf. Cathedral Peak. E.A.S. 525.

P. eriostoma (Nees) Stapf. Frequent in mesocline grassland, edge of forest, Tabamhlope Mountain. O.W. 1421.

P. natalensis Stapf. Frequent in Alpine grassland, Bushman's Pass. O.W. 1630, 1658.

P. oreadoxa Schweick. Frequent in Alpine grassland. O.W. 795, 1688, 1719.

P. pilosogluma McLean (= Achneria hirsuta (Nees) Stapf). Frequent in Alpine grassland. O.W. 791, 1636, 1659.

P. setifolia (Thunb.) McLean. Frequent at lower limits of Alpine grassland. O.W. 1619.

P. sp. (not matched). Very abundant in the *Bromus firmior* community, Alpine grassland and in shallow soil over rock. O.W. 1650.

Microchloa caffra Nees. Occasional in undisturbed veld and locally abundant in shallow soil over rock, Estcourt. O.W. 642, 743.

Rendlia nelsonii (Stapf) Chiov. Occasional in undisturbed veld and locally abundant in shallow soil over rock. O.W. 847, 1286.

Cynodon bradleyi Stent var. Old ploughed fields, Estcourt. O.W. 1123.

C. dactylon (Linn.) Pers. Old ploughed lands, kraals, termitaria, roads, etc. Locally very abundant.

Harpechloa falx (L.f.) O. Kuntze. Frequent to locally very abundant in undisturbed veld. Occurs also in Alpine grassland. O.W. 469.

Chloris gayana Kunth. Locally abundant in old ploughed lands in Thornveld. O.W. 1752.

C. pycnothrix Trin. Common ruderal at roadsides, etc., Estcourt. O.W. 1841.

C. virgata Swartz. Common ruderal at roadsides, etc., Estcourt.

Eustachys paspaloides (Vahl) L. & M. Locally very abundant on stony hillsides, Thornveld and marginal grassland. O.W. 246.

Eleusine indica (L.) Gaertn. Ruderal in cultivated fields, Estcourt. O.W. 1554.

Enneapogon scoparius Stapf. Locally frequent on krantz at Dalton Bridge. J.A. 10625.

Fingerhuthia africana Lehm. Locally abundant in Thornveld near Weenen. O.W. 1519.

Phragmites communis Trin. Important in the reed swamp stage of the hydrosere along streams, etc., throughout the area.

Eragrostis aspera Nees. A garden weed, Estcourt. J.A. 10227.

E. caesia Stapf. Locally abundant on the Little Berg and Drakensberg from 6,500 to 8,000 ft. on paths and small disturbances. O.W. 786, 796.

E. capensis (Thunb.) Trin. Frequent in undisturbed veld, occasional on old disturbances, Estcourt and Tabamhlope. O.W. 459, 644, 691, 889, 1518.

E. chalcantha Trin. Occasional to frequent in undisturbed veld, occasional in disturbed areas, Estcourt and Tabamhlope. O.W. 464, 1058, 1290.

E. chloromelas Steud. Occasional in overgrazed veld, on disturbed areas and in old ploughed lands, Estcourt. O.W. 585.

E. ciliaris (L.) R. Br. A strongly scented ruderal, occasional in cultivated fields, Estcourt. O.W. 716.

E. cilianensis (All.) Link. A weed of cultivation, Estcourt. O.W. 1846.

E. curvula Nees. Old ploughed lands, overgrazed veld and disturbed areas, Estcourt. O.W. 682, 747.

E. gummiflua Nees. Occasional on rocky outcrops and in secondary grassland, Estcourt. O.W. 1600.

E. nebulosa Stapf. Locally abundant in moist sites, Estcourt and Tabamhlope. Forms consocies in sedge meadow stage of hydrosere. O.W. 111, 726, 1562.

E. patenti-pilosa Hack. An important pioneer on bare areas due to overgrazing and trampling, or surface erosion in the Thornveld and marginal grassland. O.W. 269, 721.

E. plana Nees. Old ploughed lands, overgrazed veld, disturbed areas, Estcourt. Locally very abundant. O.W. 237, 746.

E. robusta Stent. Locally very abundant on old ploughed lands, disturbed areas, Tabamhlope Mountain. O.W. 247, 1082, 1416.

E. tef (Zucc.) Trott. (= E. abyssinica Schrad.). Occasional weed of cultivation, Estcourt. O.W. 1748.

E. sp. near **E. tenuiflora** Rupr. ex Steud. Moist, shaded situation near Estcourt. O.W. 1753.

Koeleria cristata (L.) Pers. Frequent in undisturbed veld on the Tabamhlope Plateau and in Alpine grassland. O.W. 406, 462, 797, 833, 890, 1055, 1682, 1720, 1738, 1757.

Melica racemosa Thunb. Locally abundant in the Thornveld in light shade. O.W. 851, 1320.

Stiburus alopecuroides Stapf. Colonises small disturbances in undisturbed veld, Tabamhlope Mountain. O.W. 103, 781.

S. conrathii Hack. On the Little Berg, Estcourt Herb. 2689.

Poa annua Linn. Waste places, in shade, Esctourt. O.W. 1338.

P. binata Nees. Frequent to locally abundant in Alpine grassland where it forms a turf; occasional in undisturbed veld and mesocline grassland, Tabamhlope; frequent in sedge meadow stage of hydrosere. O.W. 391, 839, 1288, 1325, 1652, 1717.

P. sp. near **P. binata** Nees. Mesocline grassland, Draycott Hill. J.A. 10591.

Festuca caprina Nees. Abundant in Alpine grassland. Occasional in sedge meadow stage of hydrosere. O.W. 841, 1633, 1686.

F. caprina Nees var. **irrasa** Stapf. Abundant in Alpine grassland. Frequent in the mesocline grassland at forest margin, Tabamhlope Mountain. O.W. 1410, 1622, 1631, 1632, 1662.

F. caprina Nees var. **macra** Stapf. Frequent in Alpine grassland. Abundant on rock outcrops. O.W. 1716, 1730.

F. costata Nees. A tall grass, frequent in the mesocline grassland below forest, Tabamhlope Mountain. O.W. 1381, 1425.

F. elatior Linn. var **arundinacea** (Schreb.) Wimm. At upper edge of forest, Tabamhlope Mountain. The leaves are remarkably sweet to taste. O.W. 1850.

F. scabra Vahl. Frequent in Alpine grassland. Locally abundant on shallow soil over rock. Occasional in undisturbed veld, Tabamhlope Plateau. O.W. 842, 1287, 1721, 1739, 1756.

F. sp. (not matched). Frequent in Alpine grassland on Bushman's Pass. O.W. 1628, 1643, 1635, 1665.

Vulpia bromoides (Linn.) S. F. Gray. A weed in cultivated pastures, Tabamhlope. O.W. 1587.

Bromus catharticus Vahl. Locally abundant in shaded, moist situations, Estcourt. O.W. 1321.

B. commutatus Schrad. A weed in cultivated pastures, Tabamhlope. O.W. 1522.

B. firmior (Nees) Stapf. A tall grass which dominates an important consocies in Alpine grassland. O.W. 1620.

B. leptoclados Nees. Occasional, in shade, at about 5,000 ft., Tabamhlope Mountain. O.W. 126, 1530.

B. molliformis Lloyd. A weed in cultivated pastures, Tabamhlope. O.W. 852.

B. natalensis Stapf (probably). Mesocline grassland below forest on Tabamhlope Mountain. O.W. 1380.

Brachypodium bolusii Stapf. Frequent in Alpine grassland. O.W. 793.

B. flexum Nees. Occasional in Alpine grassland. O.W. 1529A.

Lolium multiflorum Lam. Weed, occasional in cultivated fields and waste places, Tabamhlope. O.W. 125.

L. rigidum Gaudin. Weed, occasional in cultivated fields, Estcourt. O.W. 1524.

Arundinaria tesselata (Nees) Munro. A slender bamboo, common in forest margins along streams on the Little Berg. Collected by Hutchinson in the Tugela Gorge. Hutch. 4532.

CYPERACEAE.

Cyperus albostriatus Schrad. Common in forest. W. W. & A. 28.

C. **compactus** Lam. Occasional in undisturbed grassland, Estcourt. O.W. 514.

C. sp. cf. C. **compressus** Linn. Shallow soil in the Thornveld. J.A. 9877.

C. **corymbus** Benth. Along streams in Thornveld. J.A. 10827.

C. **denudatus** Linn. f. Common in vleis and sedge meadow stage of the hydrosere, Tabamhlope. O.W. 572, 573.

C. **difformis** Linn. In a dam, at the water's edge, Estcourt. O.W. 1817, 1818.

C. sp. near C. **difformis** Linn. In a dam, at the water's edge, Estcourt. O.W. 1820.

C. **esculentus** Linn. A troublesome weed in cultivated fields, Tabamhlope. O.W. 541.

C. **fastigiatus** Rottb. Abundant in vleis, important in the reed swamp stage of the hydrosere, Tabamhlope. O.W. 909, 1592, 1836.

C. **haematocephalus** C. B. Cl. Seepage areas in grassland, edge of Thornveld. J.A. 10229, 10297.

C. **marginatus** Thunb. Abundant in vleis, dominates an important consocies in the hydrosere–reed swamp stage. O.W. 1792.

C. **semitrifidus** Schrad. Occasional in undisturbed grassland, Tabamhlope. O.W. 539.

C. **sexangularis** Nees. Beside stream, in Thornveld. J.A. 9973.

C. **teneriffae** Poir. Shallow soil in Thornveld. J.A. 9967.

Pycreus elegantulus C. B. Cl. Streamsides at foot of the Little Berg. J.A. 10089.

P. **ferrugineus** C. B. Cl. Along stream in Thornveld. J.A. 10848.

P. **flavescens** Reichb. Common in mud around vleis. O.W. 1823.

P. **lanceus** (Thunb.) Turrill. (= P. umbrosus Nees). Common in vleis. Sedge meadow stage of the hydrosere. O.W. 574.

P. **mundtii** Nees. Along streambanks in the Thornveld. O.W. 1195, 1196.

P. **oakfortensis** C. B. Cl. Common in vleis, sedge meadow stage of hydrosere, Tabamhlope. O.W. 836.

P. **rehmannianus** C. B. Cl. ex descr. Along stream in Thornveld. J.A. 10824.

Mariscus albomarginatus C. B. Cl. Occasional in the lithosere. O.W. 1496.

M. **capensis** Schrad. Common in the lithosere on krantzes, etc. O.W. 1497, 1498.

M. **congestus** C. B. Cl. Common in dams and in boggy patches, Estcourt. O.W. 113, 1769, 1819, 1825.

M. **sieberianus** Nees. Margin of Thornveld, in grass. J.A. 10030.

M. sp. cf. M. **sieberianus** Nees. Common in vleis. Sedge meadow stage of the hydrosere, Tabamhlope. O.W. 569.

M. **umbellatus** Vahl. On a krantz, Estcourt. J.A. 9937.

Kyllinga alba Nees. Common in vleis, sedge meadow stage of the hydrosere, Tabamhlope. O.W. 830.

K. **erecta** Schumach. Common in vleis, sedge meadow stage of the hydrosere in moist grassland, Tabamhlope. O.W. 570, 1591.

Ficinia stolonifera Boeck. ex descr. Streambank in grassland. J.A. 10739.

Fuirena coerulescens Steud. Moist sites in grassland, Estcourt. J.A. 9845.

F. **pubescens** Desf. Common in vleis. Sedge meadow stage of the hydrosere, Tabamhlope. O.W. 571.

Scirpus cernuus Vahl. Locally abundant at edge of vleis and wet river banks, Estcourt. O.W. 382, 1824.

S. **corymbosus** Rottb. Abundant in vleis. Important in the reed swamp stage of the hydrosere, Tabamhlope. O.W. 910.

S. **falsus** C. B. Cl. Common in Alpine grassland and in lithosere. O.W. 1684, 1731.

S. **fluitans** Linn. Weed in pasture on vlei ground, Tabamhlope. O.W. 1588.

S. **macer** Boeck. Frequent on river banks, Estcourt. O.W. 1315.

S. **paludicola** Kunth. Common in vleis, around dams, etc., Estcourt and Tabamhlope. O.W. 834, 1816.

S. **prolifer** Rottb. Rocky stream bed, Dalton Bridge. W. W. & A. 30.

S. **setaceus** Linn. Frequent on river banks, Estcourt. O.W. 1316.

S. sp. (probably new) near S. **costatus** Boeck. In wet places, Griffin's Hill. J.A. 10298.

Fimbristylis complanata Link. In vleis, Colenso and Frere. J.A. 10029.

F. **diphylla** Vahl. Vleis, margin of Thornveld. J.A. 9980.

F. **monostachys** Hassk. Occasional in undisturbed veld, Estcourt. O.W. 513, 1484.

F. sp. (not matched). Grassy slopes, Draycott Hill. J.A. 10576.

Bulbostylis burkei C. B. Cl. ex descr. Thornveld. J.A. 10840.

B. **cinnamomea** C. B. Cl. Grassland, Estcourt, J.A. 9843.

B. **collina** Kunth. Common in vleis. Sedge meadow stage of the hydrosere, Tabamhlope. O.W. 835.

B. **humilis** Kunth. In patches of mossy soil on sandstone sheets. J.A. 11369.

B. **scleropus** C. B. Cl. Occasional in undisturbed veld, Estcourt. O.W. 511.

B. schoenoides Kunth. Mesocline grassland, Draycott Hill, J.A. 10576.
B. trichobasis C. B. Cl. Occasional in undisturbed veld, Estcourt. O.W. 512.
Rhynchospora glauca Vahl. Forest margin and streambanks, at foot of Little Berg. J.A. 10090.
Scleria buchanani Boeck. Grassland and edge of Thornveld. J.A. 10735, 10758.
S. meyeriana Kunth. Streambanks in Thornveld. J.A. 10850.
S. sp. (not matched). Grassland, Tabamhlope. J.A. 10007.
S. sp. (not matched). Banks of stream, in grassland. J.A. 10738.
Schoenoxiphium caricoides C. B. Cl. Marginal Thornveld, Estcourt. J.A. 10759.
S. kunthianum Kukenth (= Carex dregeana Kunth.). Undergrowth in semi-deciduous bush in Thornveld. O.W. 1194.
S. rufum Nees. Common in Alpine grassland and at forest margin, Tabamhlope. O.W. 1412, 1709.
S. sparteum Kukenth. Common in Alpine grassland and in shade in the Leucosidea Consocies. O.W. 636, 1660.
Carex cernua Boott. Occasional at outer margin of reed swamp stage of the hydrosere, Tabamhlope. O.W. 826, 827.
C. cernua Boott. var. **austro-africana** Kukenth. In forest, near Tabamhlope Mountain. J.A. 10784.
C. clavata Thunb. Streambank, Estcourt. J.A. 9976.
C. spicato-paniculata C. B. Cl. Occasional along streams in the Little Berg. O.W. 102, 161.
C. vulpina L. (= C. glomerata Thunb.). Streambank, Estcourt. J.A. 9915.

ARACEAE.

Zantedeschia aethiopica Spreng. Occasional in moist places in the Little Berg. O.W. 1862.
Z. albomaculata Baill. Occasional in moist places, Tabamhlope Plateau and Little Berg. O.W. 635.

RESTIONACEAE.

Restio sp. At edge of krantz, Tabamhlope Mountain. J.A. 11473.

XYRIDACEAE.

Xyris capensis Thunb. Wet places in grassland. J.A.10311.
X. gerrardii N. E. Br. Occasional in vleis. Sedge meadow stage of the hydrosere, Tabamhlope. O.W. 543.

COMMELINACEAE.

Commelina africana Linn. Occasional in undisturbed veld, common in secondary grassland. Occasional in Thornveld. O.W. 669, 1536.
C. benghalensis Linn. Common in Thornveld. O.W. 1029, 1795.
C. krebsiana Kunth. Common in Thornveld. O.W. 1500.
Cyanotis nodiflora Kunth. Occasional in undisturbed grassland and in the Thornveld. O.W. 1426, 1441, 1486, 1506, 1538.

JUNCACEAE.

Juncus acutus Linn. var. **leipoldii** Buch. In tussocks, along rocky stream, Brakfontein. J.A. 10847.
J. sp. cf **J. capensis** Thunb. River banks. J.A. 10657, 11503.
J. effusus Linn. Frequent in vleis. Sedge meadow stage of the hydrosere, Tabamhlope. O.W. 833, 1427.
J. exertus Buch. Occasional in vleis. Sedge meadow stage of the hydrosere, Tabamhlope. O.W. 911.
J. lomatophyllus Spreng. Streambank, Estcourt. J.A. 9978.
J. oxycarpus E. Mey. Abundant in vleis. Important in reed swamp stage of the hydrosere. O.W. 1318, 1834.
J. punctorius Linn. f. Along stream in Thornveld. J.A. 10825.
J. rostratus Buch. Locally abundant in vleis. Reed swamp stage of the hydrosere, Estcourt. O.W. 1822.
Luzula africana Drege. Common in Alpine grassland. O.W. 1683.

LILIACEAE.

Littonia modesta Hook. Rare in Thornveld, Estcourt. O.W. 2128.
Sandersonia aurantiaca Hook. "Christmas Bells." On Tabamhlope Mountain.
Wurmbea kraussii Baker. Locally abundant in grassland on Little Berg Plateau, in shallow soil. O.W. 1278.
Bulbine asphodeloides R. & S. Occasional in Alpine grassland. O.W. 1361, 1695
B. narcissifolia Salm Dyck. Occasional to locally abundant in Thornveld. O.W 1177, 1210.

Anthericum cooperi Baker. Locally abundant in moist sites in grassland, Tabamhlope O.W. 446.

A. gerrardi Baker. Undisturbed veld, Estcourt. O.W. 1577.

A. sp. near **A. hirsutum** Thunb. Cathedral Peak. E.A.S. 553.

A. sp. Fairly frequent on steep dolerite slope. J.A. 10610.

A. sp. Occasional in undisturbed veld, Estcourt and Tabamhlope. O.W. 421, 440 449.

A. sp. Locally abundant in moist grassland, Tabamhlope. O.W. 450.

Chlorophytum bowkeri Baker. Under trees, Estcourt. J.A. 10753.

C. elatum R. Br. In forest undergrowth, Tabamhlope. O.W. 1784.

C. sp. Occasional in shade, in Thornveld.

Bowiea volubilis Harv. Occasional on krantzes and in the Thornveld. O.W. 617, 769.

Eriospermum burchelli Baker. In Thornveld, Estcourt. J.A. 9828.

E. sp. (not matched). In undisturbed veld and on rock ledges, Tabamhlope. O.W. 542, 1420, 1422.

Kniphofia breviflora Harv. ex Baker. Drakensberg National Park. A. & H. 237.

K. galpinii Baker. Along streams to 9,000 ft. O.W. 1744.

K. natalensis Baker. Rocky slope, Griffin's Hill. J. A. 11217.

K. thodei Baker. On rocks, Dalton Bridge. J.A. 11359.

K. spp. Specific names await a revision of the genus. O.W. 400, 595, 704, 708, 1360.

Aloe arborescens Miller. Locally abundant on krantzes and rocks. O.W. 1080.

A. bainesii Dyer. Locally abundant on mountain slopes in Thornveld.

A. boylei Baker. Occasional in grassland, Little Berg. O.W. 1528.

A. cooperi Baker. Common in grassland along the margin of the Thornveld. O.W. 538A.

A. dominella Reynolds. Locally abundant in very restricted areas at margin of the Thornveld. O.W. 2125.

A. mudenensis Reynolds. Locally very abundant on rocky hillsides in Thornveld. J.A. 10527.

A. nitens Baker. Occasional in thick bush in the Thornveld. O.W. 1217.

A. saponaria Haw. Occasional to locally abundant at margin of Thornveld and along river valleys up to the Little Berg. O.W. 1709.

A. spectabilis Reynolds. A tall aloe, common in Thornveld.

Leptaloe albida Stapf. Occasional in margin of the Thornveld. O.W. 1504.

L. minima Baker (Aloe blydrivierensis Groenewald). Rare, in undisturbed veld. O.W. 1598.

Agapanthus campanulatus Leighton. Moist sites, rock ledges, krantzes, etc., Tabamhlope and the Little Berg. O.W. 579.

Tulbaghia alliacea Linn. f. Occasional in moist sites in grassland, margin of the Thornveld. O.W. 1327.

T. natalensis Baker. Locally abundant in moist sites in grassland, Tabamhlope. O.W. 832, 396.

Albuca humilis Baker. In moist shallow soil over rock, Tabamhlope Mountain (the type locality).

A. pachychlamys Baker. Common in undisturbed veld at margin of Thornveld. O.W. 373, 374, 388, 1176.

Urginea capitata Baker. In marginal grassland. J.A. 10547.

U. multisetosa Baker. Common in grassland along the margin of the Thornveld. O.W. 372.

Galtonia candicans Dcne. Common in moist sites, rock ledges, etc., in Alpine grassland. O.W. 1701.

G. princeps Dcne. Common in shade of Leucosidea Consocies. O.W. 110.

Drimia alta R. A. Dyer. Occasional at edge of Thornveld. O.W. 815, 1355, J.A. 9842.

D. villosa Lindl. ex descr. Rocky slopes, Griffin's Hill. J.A. 10631.

Dipcadi polyphyllum Baker. Occasional in undisturbed veld, Tabamhlope. O.W. 587

D. sp. Marginal grassland. 6 in. herb. J.A. 10622.

D. sp. In Thornveld, Estcourt, O.W. 1515.

Scilla cooperi Hook. f. Drakensberg National Park. A. & H. 2063.

S. polyantha Baker. Common in wattle plantation, Tabamhlope. O.W. 621.

S. sandersoni Baker. In grassland, Griffin's Hill. J.A. 10734.

S. saturata Baker. Moist sites. Abundant in sedge meadow stage of the hydrosere. O.W. 844.

S. spp. Unidentified specimens awaiting a revision of the genus. O.W. 125, 229, 311, 317, 1346, 1347, 1362, 1363, 1369, 1370.

Schizocarphus rigidifolius F. v. d. M. (= Scilla rigidifolia Kunth.). Occasional in undisturbed veld, Tabamhlope. O.W. 477.

Eucomis humilis Baker. Tabamhlope Mountain. Evans 398 (type gathering).

E. nana Ait. Locally abundant on rock outcrops on summit of Tabamhlope Mountain. O.W. 601.

E. puctata L'Her. On krantzes, Tabamhlope. J.A. 11435.

E. undulata Ait. Occasional in undisturbed veld, Estcourt and Tabamhlope. O.W. 548, 730.

Ornithogalum sp. near **O. eckloni** Schltr. Grassland on slopes of Tabamhlope Mountain. O.W. 623, 1401.

O. inconspicuum Baker. Giant's Castle. A. Bolus in Bolus Herbarium No. 23003.

O. leptophyllum Baker. In grassland, Estcourt, and on rock ledges and sedge meadow Tabamhlope. O.W. 320, 332, 337, 1407.

O. longiscapum Baker. Occasional in grassland, Tabamhlope. O.W. 554, 555.

O. oliganthum Baker. Shallow mossy soil on sandstone, Draycott Hill. Flowers white, 1 in. to 3 in. tall. J.A. 10582.

O. pretoriense Baker. Muden. Wylie in National Herbarium, Pretoria, No. 22821.

O. sp. cf. **O. subulatum** Baker. Common on tussocks in bed of Bushman's River. J.A. 10627.

O. virens Lindl. In grassland, Tabamhlope. O.W. 673A.

O. sp. Umhlumba Mountain. Matches Evans 644. O.W. 1443.

Elsiae sp. (**Ornithogalum diphyllum** Baker). Locally abundant in shallow moist earth over rocks, Tabamhlope. Evans 374, O.W. 606.

E. sp. Estcourt and Tabamhlope. O.W. 312, 829.

Sansevieria thyrsiflora Thunb. Locally abundant in Thornveld. Usually in shade, on krantzes, etc. O.W. 1599.

Asparagus aethiopicus Linn. Among rocks, Griffin's Hill. J.A. 11413.

A. africanus Lam. Margins of Thornveld. O.W. 364, 1573 ; J.A. 10626.

A. asiaticus Linn. Along streams in Thornveld. J.A. 10648.

A. falcatus Linn. Common in Thornveld. O.W. 1231.

A. myriocladus Baker. On rocky hillsides, Estcourt. J.A. 10651, 10817.

A. virgatus Baker. Common in Thornveld in partial shade. O.W. 1334.

AMARYLLIDACEAE.

Hessea schlechteri O. Kuntze. Recorded by Bews (1921) from Mooi River.

Haemanthus albiflos Jacq. Locally abundant on rock ledges, Tabamhlope. O.W 1365.

H. hirsutus Baker. Occasional in grassland. J.A. 10679, 10778.

H. magnificus Herb. Occasional in forest, Tabamhlope Mountain. O.W. 1348.

Boophone disticha Herb. In grassland, Griffin's Hill.

Nerine appendiculata Baker. Grassland at edge of forest and on streambank, Tabamhlope Mountain. O.W. 171.

N. pancratoides Baker. Common in grassland. J.A. 10182.

Brunsvigia sp. allied to **B. natalesnsis** Baker. Undisturbed veld and rock ledges, Tabamhlope Plateau. O.W. 908, 1786.

B. undulata Leighton. Undisturbed veld, Tabamhlope. O.W. 1787.

Anoiganthus breviflorus Baker. Vleis and river banks. Frequent in sedge meadow stage of hydrosere. O.W. 335,395, 837; A. &. H. 244.

Apodolirion buchanani Baker. Common in undisturbed veld, Tabamhlope. O.W. 333.

Crinum bulbispermum (Burm.) M.-R. & S. Common in grass along margin of Thornveld. O.W. 390.

C. macowani Baker. Recorded by Bews from the Upper Tugela.

Cyrtanthus contractus N.E. Br. Common in grass along the margin of the Thornveld. O.W. 342.

C. galpinii Baker. In grass, on hillsides in Thornveld. J.A. 10668.

C. tuckii Baker var. **viridilabus** Verdoorn. Banks of streambed, in Thornveld. J.A. 10524.

Hypoxis argentea Harv. Common in grassland, Estcourt. O.W. 360, 363.

H. filiformis Baker. In seepage areas, rare. J.A. 10587.

H. gerrardii Baker. Along stream. J.A. 10832.

H. multiceps Buching. Steep, stony slopes. Occasional. J.A. 10605.

H. oblonga Nel. Recorded by Bews from Weenen County.

H. rigidula Baker. Occasional in grassland, in moist sites. O.W. 138, 903.

H. rigidula Baker var. **pilosissima** Baker. Alpine grassland. E.A.S. 466.

H. rooperi Moore. Occasional in grassland. O.W. 535.

H. villosa Linn. Occasional in grassland and locally abundant in moist sites. O.W. 387, 441.

Rhodohypoxis baurii (Baker) Nel. Occasional to locally abundant in moist sites in grassland. O.W. 401, 605, 1279.

VELLOZIACEAE.

Vellozia talboti Balf. Locally abundant on rock ledges under forest. O.W. 3; J.A. 10101,11442.

V. viscosa Baker. Common on rock ledges, Tabamhlope Mountain. O.W. 616, 1395, 1396.

DIOSCOREACEAE.

Dioscorea cotinifolia Kunth. Estcourt. J.A. 10796.

D. crinata Hook. f. Occasional in bush and forest. O.W. 1502.

D. dregeana Baker. Occasional in bush. O.W. 1477.

D. rupicola Kunth. In forest margin. J.A. 10074.

D. sylvatica Eckl. Bush-covered krantzes in Thornveld. J.A. 11420.

IRIDACEAE.

Romulae sp. Cathedral Peak. E.A.S. 539.

Moraea glauca Wood & Evans. Recorded by Bews from Mooi River.

M. natalensis Baker. Occasional in grassland and on rock ledges. O.W. 483, 608. 655.

M. spathulata Klatt. Along streambeds in moist sites in Alpine grassland. O.W. 1710. 1265.

M. tenuis Kerr. In grassland. J.A. 10112.

M. tricuspis Ker. In undisturbed veld, Tabamhlope. O.W. 609.

M. tripetala Ker. Common in grassland on Little Berg. O.W. 1269.

M. sp. near **M. natalensis** Baker, but flowers white. Drakensberg National Park. Hutch. 4601.

M. sp. Estcourt, common in grassland. O.W. 309.

Homeria pallida Baker. Occasional on river banks and frequent in cultivated fields O.W. 377.

Aristea cognata N. E. Br. In grassland, Drakensberg National Park.

A. flexicaulis Baker. Cathedral Peak. E.A.S. 462.

A. woodii N. E. Br. Common in grassland, locally abundant in moist sites, Tabamhlope. O.W. 78, 389.

Hesperantha baurii Baker. Common in grassland, Tabamhlope Plateau. J.A. 10176.

H. lactea Baker. Occasional to locally abundant in moist sites in grassland, Tabamhlope. O.W. 410, 452, 899.

H. sp. near **H. longituba** Baker. (= Medley Wood 8829). Common on river banks. O.W. 1681.

Dierama igneum Klatt. Cathedral Peak. E.A.S. 548.

D. medium N. E. Br. In grassland, Estcourt. O.W. 315, 336.

D. pictum N. E. Br. In grassland, Griffin's Hill. J.A. 9886.

D. reynoldsii Verdoorn. Common in grassland, Tabamhlope Plateau. J.A. 10035.

D. trichorisum (Baker) N. E. Br. Occasional in moist sites in grassland, Tabamhlope O.W. 831.

Tritonia lineata Ker. Occasional in grassland, Estcourt. O.W. 349.

Gladiolus aurantiacus Klatt. Occasional in moist sites in grassland, Estcourt. O.W. 1793.

G. crassifolius Baker. Occasional in grassland. O.W. 39.

G. ecklonii Lehm. In grassland. J.A. 10178.

G. edulis Burch. Occasional in grassland, Estcourt. O.W. 402, 482.

G. longicollis Baker. In mountain grassland. O.W. 411; E.A.S. 591.

G. ludwigii Pappe var. **calvescens** Baker. In marginal Thornveld. J.A. 10039.

G. papilio Hook. Occasional in moist sites in grassland and in sedge medow stage of the hydrosere. O.W. 447, 476.

G. pubescens Baker. Recorded by Bews from the Upper Tugela.

G. subaphyllis N. E. Br. Recorded by Bews from Giant's Castle.

Lapeyrousia cruenta Baker. In marginal Thornveld, Estcourt. J.A. 9899.

Watsonia densiflora Baker. Occasional to frequent in grassland, Tabamhlope. O.W. 14, 1431.

W. meriana Miller. Occasional to frequent in grassland, Tabamhlope Mountain. O.W. 1432.

ORCHIDACEAE.

Stenoglottis fimbriata Lindl. Locally abundant on stream bank. O.W. 1009.

S. fimbriata Lindl. var. **saxicola** Schltr. On rocks, in forest. J.A. 10100.

Habenaria clavata Reichb. In grassland. J.A. 10088.

H. dives Reichb. In grassland. J.A. 10081.

H. dregeana Lindl. In grassland, Tabamhlope. O.W. 514,1120.

H. falcicornis Bolus. Occasional in grassland, Estcourt. O.W. 1798.

H. foliosa (Sw.) Reichb. Occasional in grassland, Estcourt. O.W. 1602.

H. transvaalensis Schltr. Recorded by Bews from near Estcourt.

Bonatea boltoni Bolus. Edge of krantz in marginal Thornveld, Estcourt. J.A. 10142.

Brachycorythis ovata Lindl. Occasional in grassland on the Little Berg. O.W. 6.

Satyrium longicauda Lindl. Occasional to very common in grassland. O.W. 10, 72, 604, 670.

S. macrophyllum Lindl. Occasional in grassland, Tabamhlope. O.W. 1805.

S. neglectum Schltr. Occasional in grassland, Tabamhlope Mountain. O.W. 603.

S. ocellatum Bolus. Near Dalton Bridge. J.A. 11358.

S. parviflorum Sw. Occasional in grassland, Tabamhlope. O.W. 71.

Schizochilus flexuosus Harv. In Protea Veld. J.A. 10085.

Disa cooperi Reichb. f. In mountain grassland. O.W. 672, 1702.

D. oreophila Bolus. Occasional on rock ledges. O.W. 9.

D. polygonoides Lindl. Occasional in mountain grassland. O.W. 5, 673.

D. stachyoides Reichb. f. Occasional in grassland. O.W. 8, 671.

Disperis fanniniae Harv. On rocks, in forest. O.W. 2135, J.A. 10099.

D. tysoni Bolus. Occasional in grassland, especially moist sites, Tabamhlope. O.W. 1040, 1105.

Pterygodium hastatum Bolus. In forest. J.A. 10193.

Corycium nigrescens Sond. In grassland, Tabamhlope. J.A. 10190.

Lissochilus krebsii Reichb. f. Shale krantz. J.A. 10764.

Eulophia acuminata Rolfe. Recorded by Bews from Estcourt.

E. aemula Schltr. Occasional in grassland, Tabamhlope. O.W. 556.

E. foliosa Bolus. Occasional in grassland. Tabamhlope. O.W. 448, 475.

E. hians Spreng. In Thornveld, Estcourt. J.A. 9851.

E. oliveriana Bolus. In marginal grassland, Estcourt. J.A. 10629.

E. purpurascens Rolfe. Occasional in grassland, Tabamhlope. O.W. 677.

Angraecum tricuspe Bolus. On krantzes. J.A. 11447.

A. sp. Common epiphyte in semi-deciduous bush. O.W. 1192.

Mystacidium filicorne Lindl. On trees in kloof, Weenen. J.A. 10718.

DICOTYLEDONAE.

PIPERACEAE.

Peperomia reflexa A. Dietr. Epiphyte on trunks of trees or growing on rocks in forest. O.W. 1008.

P. retusa A. Dietr. Epiphyte on trunks of trees or growing on rocks in forest. O.W. 152.

SALICACEAE.

Salix woodii Seem. Common along rivers. Large shrub or tree. O.W. 496, 1023, 1125, 1329.

MYRICACEAE.

Myrica conifera Burm. f. Estcourt. J.A. 10493.

M. sp. Tree, occasional in forest, Tabamhlope. O.W. 205.

ULMACEAE.

Celtis kraussiana Bernh. Occasional along river banks in the Thornveld. O.W. 1174.

MORACEAE.

Ficus burtt davyi Hutch. Often seen scrambling up krantz faces and occurs as a shrub under krantzes and along streambeds in Thornveld. O.W. 1087, 1185, 1510.

F. capensis Thunb. A tree, occasional in Thornveld bush. J.A. 10723.

F. ingens Miq. Occasional throughout Thornveld where it occurs as a tree in the *Ficus* spp. community. Also seen scrambling on the faces of krantzes. O.W. 1036, 1219, 1494.

F. petersii Warb. A large tree, occasional in Thornveld. O.W. 1074.

F. pretoriae Burtt Davy. A tree, common with other *Ficus* spp. on sandstone, in Thornveld. O.W. 1218, 1220, 1221.

F. soldanella Warb. Common along sandstone ledges and outcrops in Thornveld. O.W. 1511, 1813.

URTICACEAE.

Fleurya mitis Wedd. A robust undershrub with stinging hairs, in forest. W. W. & A. 19.

Australina acuminata Wedd. Herb, frequent in forest. J.A. 10192.

PROTEACEAE.

Protea caffra Meisn. A tree, common on the Little Berg escarpment. Covers large tracts of country. O.W. 1858.

P. hirta Klotzsch. A shrub noted at high altitudes in the Drakensberg. Important in the Macchia Community.

P. flanagani Phillips. Tree, occasional in Thornveld bush. O.W. 1789.

P. roupelliae Meisn. A tree, common on slopes of Tabamhlope Mountain and the Little Berg escarpment. O.W. 1144.

LORANTHACEAE.

Loranthus dregei E. & Z. Common parasite on *Acacia* spp. O.W. 280.

L. natalitius Meisn. On thorn trees. J.A. 10751.

Viscum rotundifolium L. I. F. Common on numerous hosts in the Thornveld. O.W. 279, 820.

V. verrucosum Harv. Common in Thornveld, usually parasitising *Acacia* spp. O.W. 1186, 1208.

SANTALACEAE.

Osyris compressa (Berg.) A.DC. (= O. abyssinica Hochst.). At foot of krantz, Tabamhlope Mountain. J.A. 11483.

Osyridicarpus natalensis A.DC. Scrambling shrub in bush and forest.

Thesium asterias A. W. Hill. Drakensberg National Park. A. & H. 474.

T. costatum A. W. Hill. Occasional in grassland, Estcourt. O.W. 524.

T. deceptrum N.E. Br. Occasional in grassland, Tabamhlope. O.W. 472.

T. floribundum A. W. Hill. Occasional throughout. J.A. 10173.

T. imbricatum Thunb. Type specimen in Herb. Wood 10618, collected by J. Wylie on Niginya.

T. lobeloides A. DC. In grassland, Drakensberg. A. & H. 468.

T. natalense Sond. Occasional on steep, stony, doleritic slope. J.A. 10606.

T. cupressoides A. W. Hill. Occasional in mountain grassland, O.W. 74, 1678.

T. racemosum Bernh. Occasional in grassland, Tabamhlope. O.W. 413.

T. zeyheri A. DC. Occasional in grassland, Estcourt. J.A. 9905.

OLACACEAE.

Ximenia americana (Plum.) Linn. var. **microphylla** Welw. Thornveld. J.A. 10719,

X. caffra Sond. Occasional in kloof, Thornveld bush. O.W. 1222.

POLYGONACEAE.

Rumex acetosella Linn. Common weed of cultivation, Tabamhlope.

R. crispus Linn. Locally abundant on stream banks, Tabamhlope. O.W. 627.

R. ecklonianus Meisn. Locally abundant on disturbances, Estcourt. O.W. 1567.

R. nephalensis Spreng. Common weed of cultivation, Estcourt. O.W. 1302.

R. sagittatus Thunb. Forest margin, Tabamhlope Mountain. O.W. 191.

R. sarcorhizus Link. (= R. cordatus Desf.). Cathedral Peak. E.A.S. 1414.

R. woodii N. E. Br. Locally common in grassland. O.W. 1613.

Polygonum aviculare Linn. Garden weed. J.A. 10793.

P. lapathifolium Linn. subsp. **maculatum** Dyer & Trin. River banks, Estcourt. J.A. 10213.

P. meisnerianum Ch. & Schl. Important in the hydrosere, Estcourt. O.W. 1833.

P. salicifolium Brouss. (= P. serrulatum Lag.). On river banks, Estcourt. J.A. 10213.

P. setulosum Rich. Important in the hydrosere. O.W. 596.

CHENOPODIACEAE.

Chenopodium album Linn. var. Common weed of cultivation, Tabamhlope. O.W. 479.

C. ambrosioides Linn. A ruderal, Estcourt.

C. botrys Linn. A roadside weed, Estcourt. J.A. 11425.

C. multifidum Linn. Roadside weed, Estcourt. O.W. 1341.

C. murale Linn. A common weed, Estcourt. J.A. 10508.

C. polysperum Linn. A roadside weed, Estcourt. J.A. 10806.

C. vulvaria Linn. On eroded slope, Estcourt. J.A. 11426.

AMARANTACEAE.

Amaranthus paniculatus Linn. A common weed of cultivation. O.W. 1343.

A. spinosus Linn. Common weed of cultivation. J.A. 10157.

A. viridus Linn. Weed in gardens, Estcourt. J.A. 9963.

Kyphocarpa zeyheri (Moq.) Lopr. (= K. angustifolia Lopr.). Recorded by Bews from Mooi River.

Cyathula cylindrica Moq. Locally abundant on old termitaria in grassland, Tabamhlope. O.W. 751.

C. globulifera Moq. River banks, Estcourt. J.A. 11428.

Pupalia lappacea Juss. A herb under trees in Thornveld. J.A. 10133.

Achyranthes aspera Linn. Herb in shade. Thornveld and forest. J.A. 1012.

Achyropsis leptostachya Hook f. Occasional in Thornveld. O.W. 1547.

Alternanthera repens (Linn.) O. Kuntze. Important pioneer in denuded and overgrazed veld. Common in Thornveld. O.W. 1843.

A. sp. near **A. repens** (Linn.) O. Ktze. Common in Thronveld. O.W. 1849.

Gomphrena celosoides Mart. Important pioneer in denuded and overgrazed veld. Common on disturbances in grassland and in the Thornveld. O.W. 492.

NYCTAGINACEAE.

Commicarpus pentandrus (Burch.) Heimerl. A scrambling vine, common in Thornveld. O.W. 1444.

PHYTOLACCACEAE.

Limeum viscosum Fenzl. On disturbed areas. J.A. 10132.

Psammotropha myriantha Sond. Occasional in grassland throughout. O.W. 647, 1398, 1483.

Phytolacca heptandra Retz. In old kraals and disturbed areas, Estcourt. O.W. 632, 1563.

P. octandra Linn. Occasional to locally abundant at roadsides, abandoned cultivation and disturbed veld. O.W. 536.

AIZOACEAE.

Orygia decumbens Forsk. Weenen Nature Reserve. J.A. 10711.

Aizoon glinoides Linn. f. Common in Thornveld. O.W. 1235.

Delosperma carolinense N. E. Br. Umhlumba Mountain. O.W. 1439.

D. hirtum (N. E. Br.) L. Bolus. Common on stony hillside. O.W. 1437.

D. mahoni N. E. Br. Common in Thornveld, Estcourt. O.W. 1532.

D. tradescantioides L. Bolus. Scrambling succulent, common on krantzes. O.W. 1021, 1245.

D. velutinum L. Bolus. Locally abundant on sandstone krantzes. O.W. 1438.

D. sp. near **D. grantiae** L. Bolus. Common in shallow soil over rock, Tabamhlope. O.W. 1595.

D. sp. Draycott Hill. O.W. 1593.

Apteria cordifolia (L.f.) Schw. Common, Draycott Hill. O.W. 1593.

PORTULACACEAE.

Talinum caffrum E. & Z. Common in Thornveld, especially on bare ground. O.W. 502, 1501.

Portulaca oleracea Linn. Common weed of cultivation, Estcourt. O.W. 1521.

CARYOPHYLLACEAE.

Stellaria media Cyrill. Weed in gardens, Estcourt. J.A. 10478.

Cerastium capense Sond. Weed in gardens and waste places, Estcourt. O.W. 1645.

C. dregeanum Fenzl. Small herb on wet soil on river banks, watercourses, etc., throughout. O.W. 385, 444.

C. viscosum Linn. Draycott Hill. J.A. 11437.

Pollichia campestris Soland. Occasional in grass on rocky hillside, Estcourt. O.W. 1797.

Herniaria hirsuta Linn. Weed in waste places and bare patches in disturbed veld. J.A. 10579.

Scleranthus annuus Linn. At abandoned homestead. J.A. 10202.

Corrigiola littoralis Linn. Weed of cultivation. J.A. 10706.

Silene burchellii Otth. Occasional in grassland, Tabamhlope. O.W. 553.

S. capensis Otth. Occasional in moist sites and rock ledges, Tabamhlope. O.W. 70, 190, 562.

S. latifolia (Mill.) Britten & Rendle. A weed, O.W. 597.

Dianthus crenatus Thunb. Handsome, pink flowered herb in marginal Thornveld. J.A. 9896.

D. micropetalus Ser. Occasional in grassland, Estcourt. O.W. 739.

RANUNCULACEAE.

Anemone fanninii Harv. Locally abundant in moist sites, Little Berg. Large suborbicular leaves. O.W. 823.

Clematis brachiata Thunb. A woody vine in forest and in the Thornveld. O.W. 194, 1101.

Ranunculus cooperi Oliv. Locally abundant in streambeds and boggy patches. Large orbicular leaves. O.W. 1647.

R. meyeri Harv. Common in vleis, Tabamhlope. O.W. 1513.

R. pubescens Thunb. Locally abundant in moist sites in grassland.

MENISPERMACEAE.

Antizoma calcarifera (Burch.) Miers (= A. angustifolia Miers). Recorded by Bews from near Weenen.

LAURACEAE.

Cryptocarya woodii Engl. Occasional in forest. W. W. & A. 22.

PAPAVERACEAE.

Argemone mexicana Linn. Common weed of cultivation, Estcourt. O.W. 284, 1434.

Papaver aculeatum Thunb. Widely distributed at upper margin of forest, etc. O.W. 193.

FUMARIACEAE.

Phacocapnos pruinosa (E.M.) Bernh. Cathedral Peak. E. A. S. 506.

Fumaria officinalis Linn. In Leucosidea consocies and a weed in waste places. O.W. 630; J.A. 10477.

CRUCIFERAE.

Heliophila rigidiuscula Sond. Occasional in grass on Little Berg. O.W. 1275.

H. stricta Sond. Recorded by Bews from Giant's Castle.

H. suavissima Burch. Cathedral Peak, E.A.S. 504.

Lepidium divaricatum Sol. (= L. capense Thunb.). Common weed of cultivation. O.W. 473, 1308.

Coronopus didymus (Linn.) Sm. (= Senebiera didyma Pers.). Common weed of cultivation, Estcourt. O.W. 1344.

Sisymbrium sp. In shade of Leucosidea, Little Berg. O.W. 15.

Brassica pachypoda Thell. Weed of cultivation. O.W. 1611.

Erucastrum strigosum (Thb.) OS. Occasional in grassland, Little Berg. O.W. 1280.

Nasturtium officinale R.Br. Widely distributed water plant, even in streams on the Little Berg. O.W. 893.

Rorippa fluviatilis (E. Mey. ex Sond.) R. A. Dyer. Thornveld. J.A. 10704, 10822.

Cardamine africana Linn. Common in forest undergrowth, Tabamhlope Mountain. O.W. 1403.

Capsella bursa-pastoris (Linn.) Medik. Common weed of cultivation O.W. 1304.

CAPPARIDACEAE.

Capparis citrifolia Lam. Small tree in Thornveld. O.W. 1201.

C. gueinzii Sond. Shrub, occasional in Thornveld. O.W. 1517.

C. rudatisii Gilg & Ben. Rare, on steep bush slope. A straggling shrub 4 ft. tall. J.A. 10644.

Boscia longipedicellata Ch. & Gilg. Common tree in the Thornveld. J.A. 10561.

Maerua angolensis DC. Large tree in Thornveld. J.A. 9911.

M. triphylla (Thunb.) Dur. & Schinz. A tree, occasional in Thornveld bush. O.W. 855, 1183, 1299.

RESEDACEAE.

Oligomeris dregeana Presl. Eroded areas in Thornveld. J.A. 9946.

PODOSTEMONACEAE.

Sphaerothylax algiformis Bischoff. On stones in the Bushman's River, Estcourt. J.A. 10240.

CRASSULACEAE.

Cotyledon orbiculata Linn. forma. Common on hillsides in the Thornveld. O.W. 1078.

Kalanchoe hirta Harv. Occasional in the Thornveld. O.W. 760.

K. longiflora Schltz. Recorded by Bews from Weenen.

K. rotundifolia Harv. Occasional in Thornveld. O.W. 1025.

K. thyrsiflora Harv. Occasional in Thornveld. O.W. 1075.

Crassula drakensbergensis Schönl. River banks, Estcourt. J.A. 10800.

C. galpini Schönl. Common on rock ledges, Drakensberg. O.W. 1742.

C. inanis Thunb. Noted in vlei, Tabamhlope.

C. latispatulata Schönl. Thornveld, Estcourt. J.A. 9901.

C. lineolata Dry. In vleis, Little Berg, and occasional in Thornveld. O.W. 223. 149, 1110.

C. muscosa Linn. Face of krantz, Tabamhlope Mountain. O.W. 170.

C. obvallata Linn. Common in Thornveld. O.W. 1077.
C. rubicunda E. Mey. In Thornveld, Estcourt. J.A. 10135.
C. sarcocaulis E. & Z. Common in Alpine grassland. O.W. 1743.
C. setulosa Harv. On rock outcrops, Tabamhlope. O.W. 1045.
C. spectabilis Schönl. Colenso. J.A. 10015.
C. transvaalensis (O. K.) K. Schum. In shallow soil on dolerite. J.A. 11411.
C. umbraticola N. E. Br. Cathedral Peak. E.A.S. 417.
C. vaginata E. & Z. Occasional in undisturbed veld, Tabamhlope. O.W. 80, 668.
C. vaillantii (Willd.) Roth. Fine leaved annual on muddy river banks. J.A. 10570.
C. sp. (not matched). On steep, grassy slopes, Tabamhlope. J.A. 1077.

PITTOSPORACEAE.

Pittosporum viridiflorum Sims. Common at edge of forest and along stream banks. O.W. 150, 157, 824, 1007, 1257.

ROSACEAE.

Rubus fruticosus var. **bergii** Ch. & Schl. At roadside, Estcourt. Escourt Herbarium No. 3031.
R. ludwigii E. & Z. Occasional at edge of forest, Tabamhlope. J.A. 10033
R. rigidus Linn. Common, half-climbing shrub, on river banks. O.W. 1300.
Alchemilla elongata E. & Z. In grassland. A. & H. 562.
A. natalensis Endl. Recorded by Bews from Weenen County.
A. rehmannii Engl. In wet places, Tabamhlope. J.A. 10785.
A. woodii O. Ktze. Occasional in moist sites, Tabamhlope. O.W. 828.
Agrimonia eupatoria Linn. var. **capensis** Harv. Locally abundant in vleis in sedge meadow stage of the hydrosere. O.W. 1104.
Leucosidea sericea E. & Z. Small tree forming extensive consocies seral to forest. O.W. 18, 329, 379.
Cliffortia browniana Burtt Davy. On krantzes, Tabamhlope. J.A. 11462.
C. filicauloides H. Weim. A scrambling shrub, common in Macchia. O.W. 805.
C. linearifolia E. & Z. Small shrub, locally abundant in grassland, forming Macchia. O.W. 891.
Ç. nitidula (Engl.) Rob. var. **pilosa** H. Weim. Common constituent of Macchia. O.W. 183.
C. repens Schpl. Tabamhlope Plateau. J.A. 10496.
C. serpyllifolia Ch. & Sch. Tabamhlope Plateau. J.A. 10217.

LEGUMINOSAE.

Acacia arabica Willd. var. **kraussiana** Benth. (= A. Benthami Rochebr.). Common throughout Thornveld. J.A. 10754.
A. caffra (Thunb.) Willd. Common tree in marginal Thornveld. O.W. 277.
A. caffra Willd. var. **tomentosa** Glover. In marginal Thornveld. O.W. 503.
A. karroo Hayne. Common tree in marginal Thornveld. O.W. 278, 488.
A. litakunensis Burch. Common in lower Thornveld. O.W. 1801.
A. pennata Willd. A shrub, often half-climber. Locally abundant under krantzes, etc., forming extensive consocies (secondary ?) on mesocline hillsides. O.W. 281, 508.
A. robusta Burch. Occasional in lower Thornveld. O.W. 1207.
A. woodii Burtt Davy. A large tree, common in ecotonal grassland beyond the limits of the Thornveld proper. J.A. 10755.
Dichrostachys glomerata (Forsk.) Chiov. Shrub or small tree, occasional in lower Thornveld. O.W. 1803.
Elephantorrhiza elephantina (Burch.) Skeels. J.A. 10655.
E. woodii Phillips. Wood 7958 and Natal Herbarium No. 8768.
E. woodii Phillips var. **pubescens** Phillips. Wood 2867.
Schotia brachypetala Sond. A fine flowering tree common throughout Thornveld bush. O.W. 324.
Cassia mimosoides Linn. Small shrub, occasional in undisturbed veld and Thornveld. O.W. 1790.
C. obovata Collad. Bushveld.
Hoffmanseggia sandersoni (Harv.) Wood. Locally abundant in grassland throughout. O.W. 1433.
Calpurnia intrusa E. Mey. Shrub, occasional on river banks and in Macchia at forest margin. O.W. 201, 487.
C. subdecandra L'Herit. Shrub, locally abundant in Thornveld. O.W. 506A.
C. woodii Schinz. Foot of shale krantz. J.A. 10766.
Lotononis calycina Benth. Occasional in grassland. O.W. 1292.
L. calycina Benth. forma. Occasional in grassland. O.W. 1122.
L. corymbosa Benth. Occasional in grassland, Tabamhlope. O.W. 577.
L. eriantha Benth. Occasional in grassland, Tabamhlope. J.A. 10005.

L. cytisoides Benth. Small shrub, common in Macchia community. O.W. 91.

L. galpinii Dümmer. Common in Alpine grassland. O.W. 1666.

L. laxa E. & Z. Occasional in marginal Thornveld. J.A. 10114.

L. pulchra Dümmer. In Thornveld. J.A. 11400.

L. versicolor Benth. Occasional in Thornveld. O.W. 1168.

Buchenroedera lotonoides S. Ell. Small shrub, common on rock ledges and in Alpine grassland. O.W. 651.

B. sparsiflora W. & E. Shrub on talus slopes. J.A. 10051.

Dichilus lebeckioides DC. Small shrub in grassland. J.A. 10055.

Melolobium microphyllum E. & Z. Locally frequent on rocks. J.A. 10597.

M. obcordatum Harv. Recorded by Bews from the Upper Tugela.

Crotalaria capensis Jacq. Ornamental shrub, occasional in Thornveld. O.W. 1791.

C. distans Benth. Woody herb, in Thornveld. J.A. 10161.

Argyrolobium amplexicaule Dümmer. J.A. 11350.

A. collinum E. & Z. Occasional in Alpine grassland. O.W. 89, 1668.

A. longifolium Walp. In bed of spruit. J.A. 10013.

A. nanum Schltr. Occasional in grassland, Estcourt. O.W. 1291.

A. pauciflorum E. & Z. Estcourt. J.A. 10694.

A. pumilum E. & Z. var. **pilosum.** Margin of Thornveld. J.A. 10245.

A. rupestre Walp. In stony streambed. O.W. 1674.

A. sandersonii Harv. Occasional in grassland. O.W. 132.

A. speciosum E. & Z. Common in grassland. J.A. 9867.

A. stipulaceum E. & Z. In grassland. O.W. 1490.

A. tomentosum (Andr.) Druce. Shrub, in forest margin. O.W. 173, 200.

A. uniflorum Harv. Occasional in undisturbed veld. O.W. 639.

A. variopile N. E. Br. Common in stony streambed. O.W. 1671.

Cytisus scoparius Link. Naturalised. J.A. 10201.

Ulex europaeus Linn. Naturalised. O.W. 107.

Medicago aschersoniana Urb. Common pioneer on bare ground. Occasional in grassland, weed in cultivated pastures. O.W. 1127.

Trifolium africanum Ser. Common in undisturbed veld on Tabamhlope Mountain. Occasional in moist sites at lower altitudes. O.W. 537, 538.

T. burchellianum Ser. Occasional in undisturbed veld on mountains. O.W. 76.

T. dubium Sibth. Naturalised in moist sites. O.W. 1314.

Indigofera argyrea E. & Z In dongas in Thornveld. J.A. 9942.

I. arrecta Benth. A shrub in Thornveld. J.A. 10171.

I. astragalina DC. Occasional in grassland, Little Berg. O.W. 138.

I. cuneifolia E. & Z. Recorded by Bews from Cathkin Peak.

I. dimidiata Vogel. Wet places in dongas. J.A. 9957.

I. endecaphylla Jacq. In grassland. J.A. 9866.

I. fastigiata E. Mey. Occasional in grassland. O.W. 345.

I. foliosa E. Mey. A shrub in Macchia. J.A. 10092.

I. hedyantha E. & Z. Occasional in grassland. O.W. 610.

I. hilaris E. & Z. In grassland. J.A. 9889.

I. hirsuta Harv. A shrub in Macchia. J.A. 10066.

I. longpipes N. E. Br. A small shrub in marginal Thornveld. O.W. 1761.

I. neglecta N. E. Br. Margin of Thornveld. J.A. 9916, 9965.

I. parviflora Heyne. Recorded by Bews from Weenen County.

I. rhytidocarpa Benth. An annual, in Thornveld. J.A. 10159.

I. rostrata Bolus. Common in grassland. O.W. 657.

I. tristis E. Mey. Cathedral Peak. E.A.S. 456.

I. velutina E. Mey. Rare, in grassland. J.A. 10577.

I. woodii Bolus. Occasional in grassland. O.W. 180, 314.

Psoralea caffra E. & Z. Shrub along streams, Little Berg. O.W. 140, 252.

P. pinnata Linn. Estcourt. Wood 10261 and Wylie (Wood 10006).

P. polysticta Benth. Shrub on river banks, etc. O.W. 88, 486.

Tephrosia aemula E. Mey. Shallow soil on dolerite outcrops. J.A. 11406.

T. capensis (Jacq.) Pers. Margin of Thornveld. J.A. 10136.

T. multijuga R. G. N. Young. Woody herb, locally abundant on rocky hillsides. J.A. 10174.

T. pietersii Forbes. On rocky slopes in Thornveld. J.A. 10818.

T. polystachya E. Mey. Common shrub in Macchia community. O.W. 90, 136, 1098.

T. semiglabra Sond. An annual. J.A. 10160.

Sutherlandia frutescens R. Br. var. **communis.** Very common in stony streambed.

Lessertia perennans DC. Occasional in moist sites in grassland. O.W. 7, 895.

L. thodei L. Bolus. Common on rock outcrops in Alpine grassland. O.W. 1672, 1762.

Astragalus burkeanus Benth. A tall, woody herb, in dongas, in Thornveld. J.A. 9948.

Zornia tetraphylla Michx. In shallow soil over rock. O.W. 1582.

Desmodium scalpe (Comm.) DC. Common in forest undergrowth. O.W. 1089.

Alysicarpus violaceus (Forsk.) Schindl. (= A. rugosus DC.). A decumbent perennial herb, occasional in grassland at margin of the Thornveld. J.A. 9872.

Dalbergia obovata E. Mey. Shrub, or more often a liane. Common in Thornveld. O.W. 857, 1232, 1246.

Teramnus labialis (Linn.) Spreng. Grassy slopes. J.A. 10844.

Erythrina humeana Spreng. A shrub or small tree, occasional in Thornveld. O.W. 133; J.A. 10233.

E. **latissima** E. Mey. Steep hillside, Estcourt. O.W. 2134.

E. **zeyheri** Harv. Small shrub with underground stem, in grassland. O.W. 518.

Galactia dubia DC. Eroded Thornveld slopes. J.A. 10702.

Rhynchosia caribaea DC. Recorded by Bews from Weenen.

R. **crassifolia** Benth. Occasional in grassland. O.W. 849.

R. **effusa** (E. Mey.) Druce. A climber in Macchia. Occasional. O.W. 68.

R. **jacottetii** Schinz. Occasional in grassland. O.W. 389.

R. **memnonia** DC. Eroded Thornveld slopes. J.A. 10700.

R. **nervosa** Benth. Occasional in grassland. O.W. 318.

R. **reptabunda** N. E. Br. Common climber in Macchia. O.W. 1019.

R. **sordida** (E. Mey.) Schinz. Small shrub, in shade, in margin of Thornveld. J.A. 9864.

R. **stenodon** Baker f. Hillside in Thornveld. J.A. 11386.

R. **totta** DC. A small climber in grassland. J.A. 9858.

Eriosema distinctum N. E. Br. In marginal Thornveld.

E. **kraussianum** Meisn. Frequent to locally abundant in grassland. Frequent in old abandoned cultivation. O.W. 408.

E. **salignum** E. Mey. Locally abundant in ecotonal grassland. J.A. 9926. 9951,

Vigna capensis (Thb.) Walp. A trailing plant in grassland. J.A. 10246.

V. **galpinii** Burtt Davy. In bush, beside river. J.A. 10767.

V. **luteola** Benth. Recorded by Bews from Weenen.

V. **triloba** (Thb.) Walp. A handsome climber, occasional in Thornveld. O.W. 1247

Dolichos angustifolius E. & Z. An erect herb, occasional in marginal Thornveld J.A. 9833.

D. **falciformis** E. Mey. Trailing in grassland, frequent. J.A. 11220.

D. **gibbosus** Thunb. Trailing vine, occasional in marginal Thornveld. J.A. 9897.

GERANIACEAE.

Geranium caffrum E. & Z. Locally abundant in vleis, Tabamhlope. O.W. 558.

G. **incanum** Linn. Occasional in Alpine grassland. O.W. 1640.

G. **incanum** Linn. var. **purpureum** Burtt Davy. Common in shade of rocks, on Drakensberg.

G. **ornithopodium** E. & Z. Common in Alpine grassland. O.W. 19, 177, 1033, 1679.

G. **pulchrum** N. E. Br. Locally abundant in moist sites below forest. O.W. 1385.

G. sp. near G. **ornithopodium** E. & Z. Drakensberg National Park. A. & H. 732.

Monsonia attenuata Harv. In grassland. J.A. 10079.

M. **biflora** DC. var. **angustifolia** Burtt Davy. Occasional in Thornveld. O.W. 1782.

M. **brevirostrata** R. Kunth. Common in Thornveld. O.W. 1243.

M. **lanceolata** (Schinz) R. Kunth. Recorded by Bews from Weenen.

Pelargonium aconitophyllum E. & Z. Common in grassland. O.W. 428.

P. **alchemilloides** (Linn.) Ait. Occasional on rock outcrops. O.W. 519.

P. **australe** Jacq. Common in Alpine grassland and occurs in forest margin. O.W. 1642.

P. **bowkeri** Harv. Occasional in grassland. O.W. 424.

P. **capituliforme** Kunth. Occasional outside forest on Little Berg. O.W. 31.

P. **flabellifolium** Harv. Common in grassland, Tabamhlope. O.W. 540.

P. **inquinans** Ait. A shrub, locally abundant on krantzes. O.W. 1440.

P. **lateripes** L'Her. A vine, common in Thornveld. O.W. 1224.

OXALIDACEAE.

Oxalis convexula Jacq. Recorded by Bews from Upper Tugela.

O. **corniculata** Linn. Common on eroded areas in Thornveld. Occasional in undisturbed veld. O.W. 423, 1335.

O. **purpurata** Jacq. Occasional in grassland and on rock ledges, etc. Common weed in cultivated fields. O.W. 648, 674.

O. **setosa** E. Mey. Occasional in grassland, Little Berg. O.W. 20.

O. sp. near O. **obliquifolia** Steud. var. **hirsuta**. Cathedral Peak. E. A. S.

LINACEAE.

Linum thunbergii E. & Z. Bushman's River valley. J.A. 9933, 10042.

ZYGOPHYLLACEAE.

Tribulus terrestris Linn. A weed, roadsides and gardens. J.A. 10792.

RUTACEAE.

Fagara capensis Thunb. Small tree in moister aspects of Thornveld and in forest. J.A. 10752.

F. davyi Verdoorn. In forest, rare. W. W. & A. 20.

Calodendrum capense Thunb. A handsome tree, occasional in forest and in moist sites in Thornveld. O.W. 1512.

Vepris lanceolata (Lam.) G. Don. Thornveld bush. O.W. 1814.

Clausena anisata (Willd.) Hook. f. Common in forest and the Thornveld. O.W. 1132, 1465.

BURSERACEAE.

Commiphora caryaefolia Oliv. Thornveld tree. J.A. 9902.

C. harveyi Engl. A large tree which forms very small consociations within the semi-deciduous bush association. Locally abundant throughout the Thornveld.

MELIACEAE.

Ptaeroxylon obliquum (Thunb.) Radlk. Occasional as a small tree or shrub in Thornveld and in forest. J.A. 10529, 10558.

Melia azedarach Linn. Naturalised in the Thornveld, around old huts, etc.

MALPIGHIACEAE.

Sphedamnocarpus rehmanii Szyszyl. A climber or trailing plant in Thornveld. J.A. 10138.

S. transvaalica (O.K.) B. Davy. In bush, Estcourt. J.A. 11362.

POLYGALACEAE.

Polygala abyssinica R. Br. Drakensberg. A. &. H. 827.

P. confusa MacOwan. Common in forest undergrowth. O.W. 1400.

P. ephedroides Burch. Griffin's Hill, rare. J.A. 11221.

P. gracilenta Burtt Davy. Occasional in grassland. O.W. 501. 516., 658.

P. hispida Burch. Drakensberg. A. &. H.

P. hottentotta Presl. Frequent in grassland. O.W. 323, 369, 515, 560.

P. myrtifolia Linn. Cathedral Peak. E.A.S. 519, O.W. 1693.

P. ohlendorfiana E. & Z. Small herb in grassland. J.A. 9884.

P. persicariaefolia DC. Recorded by Bews from Weenen County.

P. praticola Chod. Cathedral Peak, E.A.S. 412.

P. refracta DC. Recorded by Bews from Tabamhlope.

P. rehmannii Chod. Drakensberg, in grassland. A. & H. 821, 824.

P. rhinostigma Chod. Small herb in Thornveld. J.A. 9839.

P. speciosa Sims (= P. virgata Thunb. var speciosa Harv.). Small shrub, common in Macchia. O.W. 141, 178, 1208, 1386; A. & H. 823; J.A. 11489.

P. ukambica Chod. Recorded by Bews from Weenen County.

P. sp. nov. (= Wylie and Wood 10577). Occasional on krantzes, Tabamhlope Mountain. O.W. 1402.

P. sp. near P. bowkeri Harv. Drakensberg. A. & H. 822.

Muraltia saxicola Chodat. Cathkin Peak (Bews).

EUPHORBIACEAE.

Andrachne ovalis Müll. Arg. Wet place on bushy slope. J.A. 1511.

Phyllanthus glaucophyllus Sond. Herb in marginal Thornveld. J.A. 9895.

P. maderaspatensis Linn. Common on eroded areas in the Thornveld. O.W. 1166.

P. meyerianus Müll. Arg. A shade herb in the Thornveld. J.A. 9919.

Croton gratissimus Burch. Occassional along sandstone krantzes and ledges in the Thornveld. O.W. 1228.

C. rivularis E. Mey. Recorded by Bews from Mooi River.

Adenocline mercurialis Turcz. Common in forest undergrowth. O.W. 1147.

Acalypha depressinerva K. Schum. Locally abundant in grassland. O.W. 455.

A. ecklonii Baill. In marginal Thornveld. J.A. 11429.

A. glabrata Thunb. var. **pilosa** Prain. Undershrub, in margin of Thornveld. J.A. 10024.

A. peduncularis E. Mey. Locally abundant in grassland. O.W. 431, 456.

A. segetalis Müll. Arg. Recorded by Bews from Colenso.

Tragia collina Prain. Recorded by Bews from Colenso.

T. meyeriana Müll. Arg. Perennial herb, locally abundant in the marginal Thornveld. J.A. 9834.

Ctenomeria cordata Harv. On a bushy krantz. J.A. 11421.

Dalechampia capensis Spreng. f. Thornveld. J.A. 11419, 11429.

Ricinus communis Linn. Naturalised and frequent along river banks.

Jatropha natalensis Müll. Arg. A herb, common in Thornveld. O.W. 1163, 1505.

Cluytia hirsuta E. Mey. In forest margin. J.A. 10094, 11419.

C. hirsuta E. Mey. var. **robusta** Prain. A straggling shrub, among boulders, in grassland. J.A. 10304.

C. monticola S. Moore. Occasional in grassland. O.W. 334, 409.

C. natalensis Bernh. On river banks. J.A. 9890.

C. pulchella Linn. Common in Macchia and forms layer societies in forest. O.W. 185, 203, 1024, 1094.

Spirostachys africanus Sond. Common on hillsides and occasional on streambanks in Thornveld.

Euphorbia epicyparissias E. Mey. A Macchia constituent, common along streams on the Little Berg. O.W. 21, 33.

E. clavarioides Boiss. A small stem succulent forming cushions. Occasional in grassland. O.W. 398A.

E. evansii Pax. A stem succulent or small tree, locally abundant in Thornveld. O.W. 1711.

E. inaequilatera Sond. In gravelly bed of donga. J.A. 10851.

E. ingens E. Mey. A stem succulent tree, locally abundant in Thornveld bush. O.W. 1214.

E. kraussiana Bernh. A small shrub, occasional in forest. O.W. 626.

E. natalensis Bernh. Frequent in grassland. J.A. 10537.

E. prostrata Ait. Weed of cultivation and an important coloniser of denuded areas. O.W. 1124.

E. pseudo-cactus Berger forma. A stem succulent shrub, locally abundant in Thornveld. O.W. 1172.

E. pulvinata Marl. A stem succulent which forms large, cushion-shaped mounds. Locally abundant in Thornveld. J.A. 10490.

E. striata Thunb. Occasional in grassland. O.W. 326, 350.

E. tirucalli Linn. A stem succulent tree, locally abundant in Thornveld bush. O.W. 1216.

E. triangularis Desf. A stem succulent tree, locally abundant in Thornveld bush. O.W. 1215.

ANACARDIACEAE.

Sclerocarya caffra Sond. Occasional in Thornveld bush. O.W. 1815.

Heeria paniculosa (Sond.) O. Ktze. Common tree in Thornveld bush. O.W. 1555.

Rhus dentata Thunb. A scrambling herb in the Thornveld. O.W. 1198.

R. dentata Thunb. var. **grandifolia** Schönl. A tree 15 ft., occasional at edge of forest and in moist aspects of the Thornveld bush. O.W. 98, 530, 1260, 1331.

R. dentata Thunb. var. **parvifolia** Schönl. A small shrub up to 3 ft. tall, common in marginal Thornveld. O.W. 368, 439, 822.

R. discolor E. Mey. A small shrub with large underground stem, occasional in grassland. O.W. 67, 561.

R. fraseri Schönl. Banks of donga. J.A. 10849.

R. gerrardi Harv. Tree, abundant along river banks in the Thornveld. O.W. 498; J.A. 10802.

R. legati Schönl. A tree along stream beds in the Thornveld bush. O.W. 1199.

R. lucida Linn. Three distinct forms are noted;—

(1) A small tree 10 ft., occasional at edge of forest. The leaves are glabrous with a varnished appearance. W.W. & A. 9.

(2) A bushy shrub about 8 ft., occasional at edge of forest. Leaves glabrous with a varnished appearance. Leaf shape quite distinct from (1).

(3) A tree 15ft., occasional in Thornveld bush. Leaves are glossy when fresh, dull when dried, and puberulent. J.A. 10156.

R. macowani Schönl. Occasional at edge of forest. O.W. 1006.

R. macowani Schönl. forma **rehmannia** Schönl. Tree, common in Thornveld bush. O.W. 1800.

R. microcarpa Schönl. A small shrub, common in Alpine grassland. O.W. 1644.

R. pentheri Zahlbr. Common in Thornveld bush. O.W. 1847.

R. pyroides Burch. Common tree in Thornveld bush. O.W. 1462.

R. tomentosa Linn. Common tree at edge of forest. O.W. 1255.

R. transvaalensis Engl. 10 ft. shrub, in bush. J.A. 10518.

AQUIFOLIACEAE.

Ilex mitis (Linn.) Raldk. Common in forest. O.W. 1136, 1137, 1376.

CELASTRACEAE.

Gymnosporia acuminata Szysz. Common in forest margin. O.W. 182, 1071, 1143

G. albata Sim. Common in forest. O.W. 1139, 1371, 1464.

G. angularis Sim. Common in bush. O.W. 1460.

G. buxifolia Szysz. Tree, occasional in forest margins, common in Thornveld bush. O.W. 397, 1377.

G. harveyana Loesn. Shrub, occasional at edge of forest. W.W. & A. 15.

G. peduncularis L. Bolus. Tree, occasional in forest margins. O.W. 1295, 1374, 1375, 1461.

G. rubra Loesn. Shrub, frequent at edge of forest. J.A. 10198.

Putterlickia verucosa Szysz. Shrub, occasional in Thornveld. O.W. 1236.

Cassine aethiopica Thunb. Common tree in Thornveld bush. O.W. 1458, 1459, 1551.

C. kraussiana Bern. Common tree in Thornveld bush. O.W. 1191.

C. velutina Loesn. Small shrub in forest. W.W. & A. 24.

ICACINACEAE.

Cassinopsis capensis Sond. A shrub forming layer societies in forest. O.W. 1018

C. tinifolia Harv. Scrambling shrub, occasional in forest. W.W. & A. 23.

Apodytes dimidiata E. Mey. Tree, occasional in forest and in moist types of Thornveld bush. O.W. 1456, 1474, 1580.

Pyrenacantha cordata Thode. Climber with large orbicular leaves.

SAPINDACEAE.

Allophylus decipiens (Presl.) Radlk. A 10 ft. tree, occasional in marginal Thornveld • J.A. 9904.

A. melanocarpus (Arn.) Radlk. Tree, occasional in forest. W.W. & A. 21.

Pappea capensis E. & Z. Tree, common in Thornveld bush. O.W. 1212, 1229.

Hippobromus pauciflorus (Linn.) Radlk. Shrub, frequent in Thornveld bush. O.W. 529.

MELIANTHACEAE.

Melianthus major Linn. Locally abundant in moist sites in grassland. O.W. 105.

M. villosus Bolus. Quoted by E. P. Phillips in Bothalia, 1921, Vol. I, p. 58.

Greyia sutherlandi Hook. & Harv. Ornamental shrub or small tree, forming consocies on steep, rocky hillsides. O.W. 1351.

BALSAMINACEAE.

Impatiens marlothiana G. M. Schultze. Frequent on rocks in forest, along forest streams, etc. O.W. 1397.

RHAMNACEAE.

Zizyphus mucronata Willd. Common in marginal Thornveld. O.W. 1556.

Scutia myrtina (Burm.) Kurz. Frequent in forest. W.W. & A. 18.

Rhamnus prinoides L'Herit. Frequent in forest and forest margins. O.W. 128, 204, 534.

R. zeyheri Sond. Occasional in Thornveld bush. O.W. 1213, 1552.

Phylica paniculata Willd. A shrub, in Macchia. O.W. 1393.

Helinus integrifolius (Lam.) O. Ktze. (= H. ovatus E. Mey.). Climbing shrub, common in Thornveld. O.W. 767, 1031, 1535.

VITACEAE.

Rhoicissus cuneifolius (E. & Z.) Planch. A vine, frequent in forest and in Thornveld. O.W. 228, 1017, 1065, 1073.

R. digitata G. & B. Occasional in Thornveld. O.W. 1202.

Cissus connivens Lam. Vine, locally frequent in Thornveld. J.A. 10709.

C. dolichopus C. A. Sm. Vine, frequent in grassland. O.W. 404.

C. humilis (N. E. Br.) Planch. In grassland. J.A. 10708.

C. woodii G. & B. Frequent in Thornveld. O.W. 220, 504.

TILIACEAE.

Corchorus serraefolius Burch. Marginal grassveld. J.A. 10837.

C. trilocularis Linn. Occasional in Thornveld. O.W. 527.

Sparmannia ricinocarpa (E. & Z.) O. Ktze. Frequent in forest undergrowth. O.W. 84, 1095, 1154.

Grewia hispida Harv. Low shrub, frequent in marginal Thornveld. O.W. 506, 1301.
G. occidentalis Linn. A shrub or small tree, occasional in Thornveld. O.W. 1240, 1307, 1466.

MALVACEAE.

Abutilon indicum G. Don. Occasional in Thornveld. O.W. 1203.
A. sonneratianum Sw. Small shrub, occasional in marginal Thornveld. O.W. 1804.
Modiola caroliniana (Linn.) G. Don. Weed of cultivation. O.W. 1353.
Malva parviflora Linn. Weed of cultivation.
Malvastrum tricuspidatum A. Grey. Frequent in Thornveld. O.W. 1250.
Sida dregei Burtt Davy. Undershrub, occasional in the Thornveld. J.A. 9856.
S. rhombifolia Linn. Frequent and important undershrub in Thornveld. O.W. 1837.
S. triloba Cav. Woody herb, occasional in shade in Thornveld. J.A. 9981.
Pavonia burchelli (DC.) R. A. Dyer. Frequent in Thornveld. O.W. 1546.
P. meyeri Mast. Occasional in forest and in Thornveld. O.W. 143, 1090.
Hibiscus atromarginatus Herb. Occasional in Thornveld. J.A. 9921.
H. calyphyllus Cav. Bushy herb, occasional in Thornveld bush. O.W. 1242; J.A. 10145.
H. hastaefolius E. Mey. Herb at roadside. J.A. 10296.
H. leiospermus Harv. Occasional in grassland and Thornveld. O.W. 693.
H. malacospermus E. Mey. Occasional in grassland. O.W. 894.
H. saxatilis Wood & Evans. River bank. J.A. 10768.
H. trionum Linn. Weed of cultivation. Occasional in disturbed grassland. O.W. 591.
H. trionum Linn. var. **lanceolatum** Harv. In bush. J.A. 11432.

STERCULIACEAE.

Melhania didyma E. & Z. Occasional in Thornveld. O.W. 1548.
Dombeya burgessiae Gerr. Very handsome, flowering shrub. O.W. 1086.
D. cymosa Harv. Small tree or shrub, common in Thornveld bush. J.A. 10144.
Hermannia coccocarpa (E. & Z.) O. Ktze. Occasional in grassland. O.W. 386.
H. depressa N. E. Br. Frequent in grassland. O.W. 308, 362.
H. geniculata E. & Z. In marginal grassland. J.A. 10839.
H. gerrardii Harv. In marginal grassland. J.A. 11348.
H. grandifolia N. E. Br. Occasional in grassland. O.W. 83.
H. grandistipula K. Schum. Herb in grassland. J.A. 9917.
H. lancifolia Szysz. In marginal grassland. J.A. 10468, 10619.
H. malvaefolia N. E. Br. Recorded by Bews from Bushman's River.
H. natalensis K. Schum. In marginal grassland. J.A. 10619.
H. parviflora (E. & Z.) K. Schum. In Thornveld. J.A. 9830.
H. woodii Schinz. In grassland. J.A. 11373; E.A.S. 457.

OCHNACEAE.

Ochna atropurpurea DC. Shrub, frequent in Thornveld and ecotonal grassland. O.W. 531, 817, 818.

GUTTIFERAE.

Hypericum aethiopicum Thunb. forma. Herb in grassland. A. &. H. 2197.
H. lalandii Chois. In grassland. J.A. 11378.
H. sonderi Bredell. Herb in grassland. A. & H. 2198.
H. spp. Frequent in grassland. O.W. 30, 634.

FLACOURTIACEAE.

Kiggelaria africana Linn. Tree, common in forest and bush. O.W. 1131, 1134, 1378, 1468.
Scolopia ecklonii Szysz. Tree, occasional in Thornveld bush. O.W. 1072, 1223.
S. flanagani Sim. Tree, occasional in bush. O.W. 1470.
S. mundtii (Arn.) Warb. Occasional in forest. O.W. 1379.
S. zeyheri Szysz. Occasional in Thornveld bush. O.W. 1455.
Trimeria grandifolia (Hochst.) Warb. Tree, frequent in forest. O.W. 1140, 1373, 1479.
H. trinervis Harv. Shrub or small tree, occasional in forest margins. O.W. 1261.
Dovyalis caffra Warb. In Thornveld bush. J.A. 10482.
D. tristis (Sond.) Warb. Frequent in bush. O.W. 1478.

BEGONIACEAE.

Begonia natalensis Hook. On rocks, in forest. J.A. 10076.
B. sutherlandi Hook. f. On rocks, in forest. O.W. 151, 196.

OLINIACEAE.

Olinia cymosa Thunb. Frequent in forest. O.W. 182, 1259.
O. emarginata Burtt Davy. Tree, in riverside bush. O.W. 1492.

THYMELAEACEAE.

Gnidia burchellii (Meisn.) Gilg. A small shrub, occasional in Thornveld. O.W. 1253.
G. capitata Linn. f. Occasional in grassland. O.W. 366, 659, 821.
G. fastigiata Rendle. J. Wylie in Herb. Wood 10528.
G. gymnostachya (Meisn.) Gilg. Occasional in Thornveld. J.A. 9875.
G. kraussiana Meisn. Occasional in grassland. O.W. 355.
G. kraussiana Meisn. var. **villosa**. Occasional in grassland. O.W. 415.
G. splendens Meisn. In grassland. J.A. 10473.
G. macropetalus Meisn. Recorded by Henkel from Weenen.
G. wylei M. Moss. In grassland. J.A. 9934.
Passerina montana Thoday. Occasional to frequent in Macchia community. O.W. 181, 485.
P. sp. (not matched). Frequent in Macchia. O.W. 1392.
Dais cotinifolia Linn. Ornamental shrub or tree. Frequent in moist aspects of Thornveld bush. O.W. 99, 510.

LYTHRACEAE.

Nesaea schinzii Koehne. Locally abundant in wet places in Thornveld. J.A. 10230.

COMBRETACEAE.

Combretum apiculatum Sond. In Thornveld. O.W. 2006.
C. glomeruliflorum Sond. Common along river banks in Thornveld bush. O.W. 398, 497.
C. glomeruliflorum Sond. var. **riparium** (Sond.) Burtt Davy. Common in Thornveld bush along hillsides. O.W. 1805.

ONAGRACEAE.

Ludwigia palustris (Linn.) Ell. Occasional in vleis. O.W. 566.
Epilobium flavescens E. Mey. Occasional in moist sites throughout. O.W. 148, 375.
E. hirsutum Linn. In Thornveld. J.A. 10116.
E. tetragonum Linn. Vleis in grassland. J.A. 10059.
Oenothera sp. probably **O. nocturna** Jacq. Common weed of cultivation. O.W. 1296.
O. rosea Ait. Common weed of cultivation. O.W. 1299.
O. tetraptera Cav. Abundant in waste land, cultivated fields, roadsides, etc. O.W. 405, 1129.
O. villosa Thunb. Common weed of cultivation. O.W. 1297.

HALORRHAGIDACEAE.

Gunnera perpense Linn. Locally abundant in moist sites. O.W. 549.
Myriophyllum spicatum Linn. Recorded by Bews from Mooi River.

ARALIACEAE.

Cussonia natalensis Sond. A tree, in Thornveld. O.W. 2005.
C. paniculata E. & Z. Occasional throughout. O.W. 1785.
C. spicata Thunb. Tree, occasional in forest and in Thornveld. O.W. 1175, 1233, 1234.

UMBELLIFERAE.

Hydrocotyle asiatica Linn. Occasional in grassland. O.W. 1826.
Sanicula europae Linn. Herb, abundant on the forest floor.
Alepidea amatymbica E. & Z. Forest margin. O.W. 175.
A. amatymbica E. & Z. forma. Locally abundant, forming dense communities in streambed. O.W. 1675.
A. baurii O. Ktze. Tabamhlope Mountain. O.W. 607.
A. ciliaris De la Roche. Recorded by Bews from Weenen.
A. jacobziae Dümmer. Edge of forest. J.A. 10070.
A. longifolia E. Mey. Bushy krantz. J.A. 11366.
A. serrata E. & Z. Occasional in vlei. O.W. 907.
A. setifera N. E. Br. Occasional in grassland. J.A. 10234.
A. woodii Oliv. Tabamhlope Mountain. J.A. 11464.
Lichtensteinia sp. (= Thode A 223). Locally abundant, forming dense comminities in streambed. O.W. 1679.

Heteromorpha trifoliata E. & Z. Tree, frequent in forest; occasional in Thornveld bush. O.W. 532.

Bupleurum mundtii Cham. & Schltr. Cathedral Peak. E.A.S. 544.

Apium leptophyllum (Pers.) F. Muell. Weed of cultivation. Occasional on river banks. O.W. 500, 1126.

Pimpinella caffra (E. & Z.) Harv. Occasional in vleis. O.W. 1118.

Sium thunbergii DC. Abundant in vleis, where it grows in standing water. Reed swamp stage of hydrosere. O.W. 564, 897, 1108.

Peucedanum caffrum Phillips. In Thornveld. J.A. 9879.

P. connatum E. Mey. In grassland. A. &. H. 1038.

P. sp. near **P. cynorrhizum** Sond. In grassland. A. & H. 1037.

ERICACEAE.

Erica algida Bolus. Frequent in Alpine grassland. O.W. 1694, 1711.

E. alopecurus Harv. Occasional along streams on Little Berg. O.W. 785.

E. caffrorum Bolus. Small shrub 4 inches tall, abundant on rocks. O.W. 613, 1389.

E. cerinthoides Linn. Rare, along river banks. O.W. 276.

E. drakensbergensis Cuth. & Bolus. Frequent in Macchia. O.W. 825.

E. ebracteata Bolus. Frequent in Macchia. O.W. 803.

E. kraussiana Klotzsch. Occasional in Alpine grassland. O.W. 1712.

E. maesta Bolus. Fairly frequent along streams and in Macchia, Little Berg. O.W. 23.

E. oatesii Rolfe. Small shrub in forest margins and along streams, Little Berg. O.W. 137, 169.

E. schlechteri Bolus. Recorded by Henkel from Mooi River.

E. thodei G. & B. Frequent in Macchia. O.W. 804.

E. woodii Bolus. Occasional to locally abundant at high altitudes. O.W. 142, 169, 1061, 1637.

E. sp. (=Galpin 6764). Possibly a form of E. **caffrorum** Bolus. Occasional in Alpine grassland. O.W. 1713.

Phillipia evansii N.E. Br. Frequent in Macchia along streams, Little Berg. O.W. 787.

MYRSINACEAE.

Myrsine africana Linn. Abundant at edge of forest. Occasional to frequent in Macchia. O.W. 93, 186, 807.

Rapanea melanophloeos E. Mey. Frequent in forest. O.W. 1142, 1258.

PRIMULACEAE.

Anagallis arvensis Linn. Common weed of cultivation. O.W. 1352.

A. arvensis Linn. var **coerulea** G. & G. Common weed of cultivation. O.W. 1160.

PLUMBAGINACEAE.

Plumbago capensis Thunb. Shrub or half-climber, locally abundant in Thornveld. O.W. 1242.

P. zeylanica Linn. Shrub or half-climber. J.A. 10777.

SAPOTACEAE.

Mimusops dispar N.E. Br. Occasional in Thornveld. J.A. 10148.

M. obovata Sond. Frequent in Thornveld bush. O.W. 1189, 1190.

EBENACEAE.

Royena cordata E. Mey. Frequent in forest and in moist type of Thornveld bush O.W. 86, 159, 1069.

R. decidua Burch. Shrub or small tree, frequent in Thornveld bush. O.W. 1184, 1330.

R. hirsuta Linn. Frequent in forest. O.W. 32.

Euchlea daphnoides Hiern. Occasional in Thornveld bush. O.W. 1180, 1182.

E. lanceolata E. Mey. Frequent in Thornveld bush. O.W. 1064, 1178, 1179, 1181.

E. natalensis A.DC. Frequent in forest. O.W. 94, 1263.

OLEACEAE.

Olea chrysophylla Lam. Frequent in Thornveld bush. O.W. 1211, 1453.

O. enervis Harv. Recorded by Henkel from Mooi River.

O. foveolata Lam. Occasional in forest and Thornveld bush. O.W. 1463; W.W. & A. 12.

O. laurifolia Lam. Large tree, frequent in forest. O.W. 1135, 1138.

Menodora africana Hook. In marginal grassland. O.W. 420, 528.

Jasminum angulare Vahl. Climber, frequent in Thornveld. O.W. 1844.

J. multipartitum Hochst. Climber, frequent in Thornveld. O.W. 418, 1157.

LOGANIACEAE.

Buddleja dysophyllus (Benth.) Phill. Shrub or half-climber, frequent in Thornveld bush. O.W. 819.

B. salicifolia Jacq. Tree, occasional in Thornveld bush. O.W. 1451.

B. salvifolia Lam. A large shrub, important in forest succession. J.A. 10566.

GENTIANACEAE.

Sebaea longicaulis Schinz. Streambank in grassland. J.A. 11405.
S. macrophylla Gilg. Occasional in Macchia. O.W. 1273.
S. procumbens A. W. Hill. On rocks at 10,000 ft. Hutch. 4574.
S. schinziana Gilg. Moist places. Hutch. 4540; W.W. & A. 4.
S. schoenlandii Schinz. Moist sites in grassland. O.W. 75, 1115.
S. sedoides Gilg. Occasional, near forest. O.W. 164.
S. spathulata Steud. Recorded by Bews from Giant's Castle.
S. thomasii Schinz. In grassland. Hutch. 4562; Wylie, in Herb. Wood 10639.
Exochaenium grande Griseb. Disturbed areas in Thornveld. J.A. 10057.
E. grande Griseb. var. **homostylum** A. W. Hill. In grassland. J. A. 10188.
Chironia krebsii Griseb. Frequent in vlei. O.W. 594.
C. palustris Burch. Occasional in boggy patches in grassland. O.W. 120.
C. purpurascens Bth. & Hook f. In grassland. J. A. 10807.
C. transvaalensis Gilg. Occasional along streams. O.W. 1831.

APOCYNACEAE.

Acokanthera venenata G. Don. Shrub or small tree, occasional in Thornveld bush. O.W. 1156.

Carissa bispinosa (Linn.) Desf. (=C. arduina Lam.). Abundant in forest, forming layer societies. Occasional in Thornveld bush. O.W. 160, 1145, 1372, 1475, 1476.

ASCLEPIADACEAE.

Raphionacme galpinii Schltr. Frequent in grassland. O.W. 356.
R. hirsuta (E. Mey.) R. A. Dyer (=R. divaricata Harv.). In grassland. J.A. 10613.
Xysmalobium parviflorum Harv. Occasional in grassland. O.W. 1366.
X. stockenstromense Scott Elliot. Weenen (Bews).
X. undulatum R. Br. Occasional in grassland. O.W. 1564.
Schizoglossum altissium Schltr. In grassland. J.A. 10225.
S. atropurpureum E. Mey. Occasional in grassland. O.W. 633.
S. bidens E. Mey. In marginal grassland. J.A. 10688.
S. decipiens N. E. Br. Recorded by Bews from Weenen.
S. elingue N. E. Br. Frequent in Alpine grassland. O.W. 1707.
S. lamellatum Schltr. Recorded by Bews from Colenso.
S. linifolium Schltr. Occasional in grassland. O. W. 653.
S. pachyglossum Schltr. In marginal grassland. J.A. 11347.
S. parile N. E. Br. Occasional in old lands. J.A. 10002.
S. pilosum Schltr. In grassland. J.A. 10708.
S. pulchellum Schltr. In grassland. J. A. 10779.
S. woodii Schltr. Occasional in Thornveld. J.A. 9865.
S. sp. near **S. hamatum** E. Mey. Alpine grassland. E.A.S. 12.
Pachycarpus campanulatus N. E. Br. Occasional in grassland. O.W. 1607.
P. dealbatus E. Mey. In grassland. J.A. 9925.
P. plicatus N. E. Br. Occasional in grassland. O.W. 1561.
P. scaber N. E. Br. Rocky slopes. J. A. 10681.
Asclepias adscendens Schltr. In marginal grassland. J. A. 9837.
A. aurea Schltr. In grassland. J.A. 10037.
A. brevicuspis Schltr. Occasional in grassland. O.W. 521, 522.
A. burchellii Schltr. Occasional in Thornveld bush. O.W. 1807.
A. decipiens N. E. Br. Recorded by Bews from Mooi River.
A. eminens Schltr. Occasional in grassland. O.W. 520.
A. fruticosa Linn. Occasional in disturbed grassland. O.W. 1811.
A. gibba Schltr. In grassland. J.A. 9926.
A. meyeriana Schltr. Occasional in grassland. O.W. 395, 1345.
A. multicaulis Schltr. Occasional in grassland. O.W. 339.
A. schizoglossoides Schltr. Occasional outside forest. O.W. 1383.
A. stellifera Schltr. Frequent in grassland. J. A. 10578.
Pentarrhinum insipidum E. Mey. In marginal grassland. J.A. 11453.

Cynanchum sarcostemmatoides K. Schum. A leafless climber recorded by Henkel from the Mooi River.

Sarcostemma viminale R. Br. A leafless creeper in Thornveld bush. J.A. 10149.
Secamone frutescens Decne. In wooded kloof in Thornveld. J.A. 10716.

Brachystelma flavidum Schltr. Common in grassland. J.A. 10511.
Ceropegia carnosa E. Mey. Vine, occasional in Thornveld bush. O.W. 1516.
C. setifera Schltr. var. Vine, occasional in Thornveld bush. O.W. 1533.
C. setifera Schltr. var. **natalensis** N. E. Br. Small vine in Thornveld. J.A. 10150.
Riocreuxia tortulosa Decne. A very handsome flowering vine in the forest. O.W. 628.
R. tortulosa Decne. var. **tomentosa** N. E. Br. Vine in forest. J.A. 10097.
Stapelia wilmaniae Luckoff. At edge of krantz. J.A. 10498.
S. woodii N. E. Br. Occasional on rocky hillsides. O.W. 707.
S. woodii N. E. Br. var. **westii** R. A. Dyer. Locally abundant in marginal Thornveld. O.W. 1531 (Type).
Huernia hystrix N. E. Br. In Thornveld. J.A. 9912.
Pergularia extensa N.E. Br. A vine, rare in grassland. O.W. 901.

CONVOLVULACEAE.

Cuscuta campestris Guncker. Locally abundant in Thornveld, parasitising a variety of plants. O.W. 212 to 223, 225, 227, 228, 229, 499.
Dichondra repens Forsk. A creeping herb, occasional in shade in Thornveld bush. O.W. 1845.
Seddera capensis Hall. f. Recorded by Bews from Colenso.
Convolvulus natalensis Bernh. forma. In Thornveld. J.A. 10568, 10624.
C. sagittatus Thunb. In Thornveld. J.A. 10552.
C. sagittatus Thunb. var. **linearifolius** Hall. f. In grassland. J.A. 10696.
C. ulosepalus Hall. f. Recorded by Bews from Weenen County.
Ipomoea albivenia Sw. Vine, occasional in Thornveld. O.W. 1266.
I. crassipes Hook. Occasional in grassland. O.W. 340, 419, 429.
I. oblongata E. Mey. Occasional in grassland. O.W. 425.
I. obscura Ker. Frequent in Thornveld. O.W. 1541.
I. oenotheroides (Linn. f.) Rafin. In marginal grassland. J.A. 11210.
I. purpurea (Linn.) Lam. Common weed of cultivation.
I. quinquefolia Hochst. Recorded by Bews from Mooi River.
I. sp. near **I. papilio** Hall. f. Vine, fairly frequent in Thornveld bush.

BORRAGINACEAE.

Ehretia rigida (Thunb.) Druce. Shrub or small tree, frequent in Thornveld bush. O.W. 399, 489, 1549.
Cynoglossum austro-africanum H. Weim. Occasional in grassland and along streams. O.W. 35.
C. enerve Turcz. Occasional in grassland. O.W. 354.
C. hispidum Thunb. In grassland. A. & H. 1316.
C. micranthum Desf. Occasional in grassland. J.A. 9927.
Tysonia africana Bolus. Frequent along streams, Little Berg. O.W. 1610.
Myosotis intermedia Link. Drakensberg. A. & H. 1313.
M. sylvatica Hoffm. Frequent in shade and locally abundant around springs in Alpine grassland. O.W. 17, 631, 1714.
Lithospermum cinereum DC. In Thornveld. J.A. 9956.
L. officinale Linn. At edge of forest. J.A. 10103.
Echium sp. near **E. violaceum** Linn. Locally abundant on streambanks in marginal Thornveld. O.W. 1514.

VERBENACEAE.

Verbena bonariensis Linn. Locally abundant on disturbed areas. O.W. 116.
V. officinalis Linn. Common weed of cultivation. O.W. 491.
V. venosa Gill & Hook. Naturalised.
Lantana salviifolia Jacq. Weed of cultivation. O.W. 490.
Lippia scaberrima Sond. Recorded by Henkel from Weenen.
Priva meyeri Jaub. & Spach. A shade herb in Thornveld bush. J.A. 10154.
Vitex harveyana H. H. W. Pearson. Upper Tugela (Bews.)
V. mooiensis H. H. W. Pearson. Tree, frequent in Thornveld bush. O.W. 1206.
V. rehmanni Gürke. Tree, frequent in Thornveld bush. O.W. 1173, 1205, 1452.
Clerodendrum caeruleum N. E. Br. Shrublet 18 in. tall in Thornveld bush. J.A. 9923.
C. glabrum E. Mey. Shrub or small tree, frequent in Thornveld bush. O.W. 122, 1083, 1806.
C. triphyllum (Harv.) H. H. W. Pearson. (Fide J. Acocks).

LABIATAE.

Ajuga ophrydis Burch. Occasional in grassland. O.W. 675, 676, 1428.
Teucrium capense Thunb. Abundant and important undershrub in Thornveld. O.W. 1838.
Leonotis dysophylla Benth. ex E. Mey. Occasional in grassland and locally abundant in forest margin. O.W. 66, 705, 1092.

L. intermedia Lindl. Bushy hillsides. J.A. 11434.

L. intermedia Lindl. var. **natalensis** Skan. Recorded by Bews from Bushman's River.

L. leonurus R. Br. Forest margin. O.W. 179.

Leucas glabrata R. Br. Forest margin. O.W. 192.

L. martinicensis R. Br. Frequent undershrub in Thornveld. O.W. 1839.

Lasiocorys capensis Benth. Undershrub, frequent in Thornveld. O.W. 1248.

Stachys aethiopica Linn. Locally abundant on rock ledges in grassland, in shade of forest and Thornveld bush. O.W. 55, 550, 1332.

S. caffra E. Mey. Undershrub in forest and Thornveld bush. O.W. 773, 1603.

S. grandifolia E. Mey. Frequent in forest undergrowth. O.W. 176, 1399.

S. leptoclada Briq. Recorded by Bews from Blaauwkrantz River.

S. rivularis Wood & Evans. Recorded by Bews from Mooi River.

Salvia repens Burch. ex Benth. Edge of forest. J.A. 10050.

S. sisymbrifolia Skan. A weed in waste land. O.W. 1306.

S. woodii Gürke. Edge of forest. J.A. 10069.

Mentha aquatica Linn. Abundant in vleis, latter stages of reed swamp and in sedge meadow. O.W. 1112, 1832.

Pycnostachys reticulata Benth. Abundant in vleis in grassland. O.W. 703, 1109; E.A.S. 407.

Plectranthus calycinus Benth. Occasional in grassland. O.W. 101, 772.

P. densiflorus T. Cooke. Recorded by Bews from Mooi River.

P. galpinii Schltr. In grassland. E.A.S.419.

P. grandidentatus Gürke. Shade herb, Thornveld. J.A. 10140.

P. hirtus Benth. Recorded by Bews from Mooi River.

P. natalensis Gürke. Occasional at edge of forest. O.W. 1096.

P. nummularius Briq. In Thornveld. J.A. 10239.

P. transvaalensis Briq. Forest margin. J.A. 10075.

Coleus pentheri Gürke. In Thornveld.

Becium obovatum N. E. Br. Frequent in grassland. O.W. 307, 346, 370.

Orthosiphon bolusii N. E. Br. Recorded by Bews from Giant's Castle.

O. macranthus Gürke. Recorded by Bews from Upper Tugela.

O. wilmsii Gürke. In Thornveld. J.A. 10712.

SOLANACEAE.

Nicandra physaloides Gaertn. Weed of cultivation. Estcourt Herb. 2655.

Lycium oxycladum Miers. Frequent in Thornveld. O.W. 1454.

L. pendulinum Miers. Frequent in Thornveld. O.W. 1249.

Withania somnifera Dunal. Frequent in Thornveld. O.W. 1442.

Physalis angulata Linn. Weed, frequent in disturbances in grassland and in cultivation. O.W. 494, 1749.

P. peruviana Linn. A naturalised weed.

Solanum aculeatissimum Jacq. Undershrub, locally abundant in forest. O.W. 1148.

S. auriculatum Ait. Shrub in waste places. J.A. 10241.

S. incanum Linn. Occasional in Thornveld and in disturbances in grassland. O.W. 526, 1193.

S. indicum Linn. Undershrub, locally abundant in forest. O.W. 1146.

S. nigrum Linn. Common weed of cultivation and occasional in disturbed grassland. O.W. 480, 493.

S. panduraeforme E. Mey. Locally abundant on disturbances in grassland. O.W. 505, 525, 736.

S. pseudocapsicum Linn. Frequent on river banks. O.W. 1293A.

S. tomentosum Linn. Frequent in Thornveld. O.W. 365.

Datura stramonium Linn. Common weed of cultivation. O.W. 284.

SCROPHULARIACEAE.

Diascia cordata N. E. Br. Frequent in Alpine grassland. O.W. 1382.

D. purpurea N. E. Br. In grassland. E. A. S. 515.

Nemesia albiflora N. E. Br. Occasional on hillside. O.W. 774.

N. coerulea Hiern. In grassland. E.A.S. 495.

N. cynanchifolia Benth. Frequent in streambed. O.W. 1677.

N. denticulata (Benth.) Grant. In grassland and along streams. O.W. 127, 1616.

N. foetens Vent. Frequent on old lands. O.W. 640.

N. melissaefolia Benth. Rock ledges and river banks. O.W. 188, 380.

Diclis reptans Benth. Frequent in grassland. O.W. 338, 443, 740, 845.

Halleria lucida Linn. Tree, frequent in forest and occasional in Thornveld bush. O.W. 69, 174, 206.

H. canescens Gürke. On rock ledges. J.A. 11440.

Phygelius aequalis Harv. ex Hiern. Streambank in forest. A. & H. 1263.

P. capensis E. Mey. ex Benth. Occasional in forest margins. O.W. 268.
Bowkeria simpliciflora MacOwan. Tree, occasional in forest margins. O.W. 85, 129.
B. triphylla Harv. Shrub, occasional in forest margins. O.W. 266.
Manulea crassifolia Benth. Frequent in Alpine grassland. O.W. 1646, 1703.
Sutera atropurpurea Hiern. Marginal Thornveld. J.A. 10113.
S. breviflora Hiern. Occasional in shade, Little Berg, and a weed in irrigated fields, Weenen. O.W. 28, 1159.
S. crassicaulis Hiern. var. **purpurea** Hiern. In grassland. E.A.S. 514.
S. floribunda O. Ktze. Frequent at edge of forest. O.W. 81, 168, 1034.
S. luteiflora Hiern. In grassland. A. & H. 1174.
S. noodsbergensis Hiern. On krantzes in grassland. J.A. 10216.
S. sp. near **S. aurantiaca** Burch. Occasional in Alpine grassland. O.W. 1708.
Zaluzianskya alpestris Diels. Occasional in Alpine grassland. O.W. 1706.
Z. capensis Walp. In disturbed soil. J.A. 10129.
Z. dentata Walp. In grassland. E.A.S. 499.
Z. goseloides Diels. In grassland. E.A.S. 493.
Z. maritima Walp. In grassland, rare. O.W. 106, 615.
Z. sp. cf. **Z. ovata** Walp. In grassland. A. & H. 1250.
Mimulus gracilis R. Br. Moist sites, sedge meadow stage of hydrosere. O.W. 442.
Limosella lineata Glk. Frequent in shallow water in vleis. O.W. 850.
L. maior Diels. Frequent in vleis. O.W. 1289.
Ilysanthes riparia Rafin. Moist sites in grassland. J.A. 10308.
Hebenstreitia dentata Linn. Frequent in grassland. O.W. 414, 1676.
H. polystachya Harv. ex Rolfe. Occasional in moist grassland. O.W. 124.
Selago capitellata Schltr. In grassland. J.A. 9936.
S. flanaganii Rolfe. Recorded by Bews from Giant's Castle.
S. immersa Rolfe. Occasional in Alpine grassland. This is the first gathering since the type was collected by Wylie and Wood in 1907. O.W. 1638.
S. longipedicellata Rolfe. In grassland. E.A.S. 503.
S. monticola Wood & Evans. In grassland. O.W. 1268.
Walafrida densiflora Rolfe. A weed of cultivation and locally abundant in over-grazed and trampled grassland. O.W. 271, 283, 484, 736.
W. tenuifolia Rolfe. Recorded by Bews from Colenso.
Veronica anagallis Linn. Occasional in wet soil. O.W. 376, 1313.
Melasma scabrum Berg. Frequent in moist sites in grassland. O.W. 706.
Alectra capensis Thunb. In marginal grassland. J.A. 11351. 11352.
A. indicum Benth. Moist sites in grassland. J.A. 2130.
A. melampyroides Benth. Frequent in vleis. O.W. 1116: J.A. 2129.
A. orobanchoides Benth. Occasional at edge of bush. O.W. 1100.
Graderia scabra Benth. Frequent in grassland. O.W. 358, 426, 1491.
Sopubia cana Harv. Locally abundant in Alpine grassland. O.W. 65.
S. simplex Hochst. Frequent in vleis. O.W. 1117.
Buchnera dura Benth. Frequent in vleis and grassland. O.W. 131, 1114.
Cycnium racemosum Benth. Occasional in Alpine grassland. O.W. 11, 611.
Rhamphicarpa tubulosa Benth. Along stream in marginal grassland. J.A. 10831.
Striga asiatica (Linn.) O. Ktze. Occasional in Thornveld. J.A. 10134.
S. elegans Benth. Occasional in Thornveld. J.A. 9929.
S. gesneroides (Willd.) Vatke. In Thornveld. J.A. 11367.
S. thunbergii Benth. Occasional in grassland. O.W. 38.
Harveya speciosa Bernh. Occasional on river banks. O.W. 1609.

PEDALIACEAE.

Ceratotheca triloba E. Mey. Occasional in Thornveld. O.W. 134.

GESNERIACEAE.

Streptocarpus gardeni Hook. Abundant on rocks in forest. O.W. 1417.
S. pentherianus Fritsch. On rocks in forest. O.W. 1337, 1419.
S. pusilla Harv. In shade of rock ledges. O.W. 656.

LENTIBULARIACEAE.

Utricularia livida E. Mey. Occasional in vleis. O.W. 1113.
U. sp. possibly **U. exoleta** R. Br., but not yet collected in flower. An important plant in the hydrosere, producing masses of free floating green matter.

ACANTHACEAE.

Thunbergia dregeana Nees. In Thornveld. J.A. 11222.
T. neglecta Sond. in Thornveld. J.A. 10799.
T. venosa C. B. Cl. Common in marginal grassland. J.A. 9898.

Chaetacanthus burchellii Nees. Frequent in grassland. O.W. 321, 427.
C. setiger (Pers.) Lind. Frequent in Thornveld. O.W. 1164. 1447.
Ruellia baurii C. B. Cl. In Thornveld. J.A. 9972.
R. cordata Thunb. Occasional in Thornveld. O.W. 417.
R. pilosa Linn. f. Recorded by Bews from Mooi River.
Crabbea acaulis N. E. Br. In Thornveld. J.A. 11212.
C. hirsuta Harv. In Thornveld. J.A. 10040.
Barleria obtusa Nees. Half-climber in Thornveld. J.A. 11343.
B. pretoriensis C. B. Cl. In shade, Thornveld. J.A. 11397.
B. sp. (not matched). In Thornveld. J.A. 9968, 10701.
Blepharis integrifolia (Linn. f.) E. Mey. In marginal grassland. J.A. 10838.
B. longispica C. B. Cl. Occasional in Thornveld. J.A. 10143.
B. natalensis Oberm. Locally abundant on eroded areas in the Thornveld. O.W. 135, 1225.
Peristrophe hensii C. B. Cl. Undershrub, frequent in the Thornveld. O.W. 1238.
P. natalensis T. Andr. Trailing herb, locally abundant on eroded areas in Thornveld. J.A. 10164.
Dicliptera clinopodia Nees. Occasional in bush and forest undergrowth. O.W. 776.
Hypoestes aristata R. Br. Frequent in bush and forest undergrowth. O.W. 1022.
H. verticillaris R. Br. In bush and forest undergrowth. O.W. 221, 775.
Adhatoda andromeda C. B. Cl. In grassland. A. & H. 1411.
Isoglossa grantii C. B. Cl. Undershrub, important in bush and forest. O.W. 1604.
Justicia kraussii C. B. Cl. Undershrub, frequent in Thornveld. O.W. 1237.

PLANTAGINACEAE.

Plantago lanceolata Linn. Common weed of cultivation. O.W. 1294A.
P. major Linn. Common along streams. J.A. 997.
P. remota Lam. Recorded by Bews from Mooi River.
P. sp. (not matched, = Gerstner 2829). O.W. 1342.

RUBIACEAE.

Oldenlandia amatymbica O. Ktze. Frequent in grassland. O.W. 325, 361, 451.
O. natalensis (Hochst.) O. Ktze. Frequent in grassland. O.W. 121, 162.
O. thymifolia O. Ktze. Recorded by Bews from Blaauwkrantz.
Burchellia bubalina (Linn. f.) Sims. Shrub in forest margins. A. &. H. 1426.
Randia rudis E. Mey. Shrub, frequent in Thornveld. O.W. 1162.
Pentanisia prunelloides (Klotz. ex E. & Z.) O. Ktze. Occasional in grassland. O.W. 322, 353, 430, 622.
P. prunelloides (Klotz. ex E. & Z.) O. Ktze. var. **glaucescens.** In grassland. J.A. 10805.
Vangueria infausta Burch. Near Muden. Tree, occasional in Thornveld. O.W. 2252.
Pygmaeothamnus chamaedendrum (O. Ktze.) Robyns var. **setulosus** Robyns. Locally abundant in grassland. O.W. 764.
P. pilosus Robyns. Shrub with large underground stems, locally abundant in grassland. J.A. 9952, 10764.
Tapiphyllum parvifolium (Sond.) Robyns. Common in Thornveld. J.A. 10695.
Canthium ciliatum (Kl.) O. Ktze. Undershrub, abundant in forest. O.W. 1063, 1133, 1472, 1473.
C. mundtianum Cham. & Schltr. Tree, frequent in Thornveld bush. O.W. 1197, 1471.
C. pauciflorum (Klotz.) O. Ktze. Shrub at edge of forest. J.A. 10199.
C. inerme (Linn. f.) O. Ktze. Shrub or tree, occasional to frequent in forest and Thornveld bush. O.W. 1256, 1457, 1467.
Pavetta assimilis Sond. Tree, occasional in Thornveld bush and in forest margins. O.W. 766.
P. gracilifolia Bremek. Shrub in Thornveld. J.A. 9909.
P. cooperi Harv. Shrub, occasional in Thornveld bush. O.W. 759, 1469.
Galopina circaeoides Thunb. Occasional in undergrowth in forest and in bush. O.W. 1762, 1765.
Anthospermum aethiopicum Linn. var. **ternifolium** Sond. Occasional in grassland. J.A. 10507.
A. hedyotideum Sond. Occasional in grassland. O.W. 29.
A. lanceolatum Thunb. In grassland and marginal Thornveld. A. & H. 1424; J.A. 10494.
A. pumilum Sond. Occasional in grassland. O.W. 733.
A. rigidum E. & Z. Frequent in Thornveld. O.W. 1165.
Richardsonia pilosa H. B. & K. A weed of cultivation. J.A. 10108.
Spermacoce natalensis K. Schum. In grassland. Hutch. 1859; J.A. 10054.
Galium garipense Sond. Frequent in vlei. O.W. 1829.

G. rotundifolium Linn. In forest margin. W. W. & A. 3.
G. subvillosum Sond. Rocky slopes. J.A. 10054.
Rubia petiolaris DC. var. **heterophylla** DC. In Thornveld. J.A. 10125.

VALERIANACEAE.

Valeriana capensis Thunb. Occasional in vlei. O.W. 898.

DIPSACEAE.

Cephalaria attenuata R. & S. Occasional in grassland. O.W. 77.
C. **attenuata** R. & S. var. On krantzes. J.A. 11465.
C. **natalensis** O. Ktze. Forest margin. J.A. 11385.
C. **ustulata** R. & S. Occasional in grassland. O.W. 637.
Scabiosa drakensbergensis B. L. Burtt. Edge of forest. J.A. 10073.
S. sp. probably S. **columbaria** Linn. Occasional in grassland. O.W. 139, 416, 457.

CUCURBITACEAE.

Melothria punctata Cogn. Vine, frequent in forest. O.W. 629.
M. sp. (unnamed). At foot of krantzes. J.A. 11482.
Kedrostis foetidissima (Jacq.) Cogn. Vine, occasional in Thornveld. O.W. 1597.
K. **glauca** Cogn. In Thornveld. J.A. 10653.
Momordica foetida Schum. On river banks. J.A. 11427.
Cucumis africanus Linn. Frequent in grassland. O.W. 523.
C. **dissectifolius** Naud. Recorded by Bews from Mooi River.
Coccinia palmata Cogn. Vine, occasional in bush and forest. O.W. 1102, J.A. 9873.

CAMPANULACEAE.

Wahlenbergia capillacea A. DC. Occasional in grassland. J.A. 10186.
W. **cernua** A. DC. Frequent on rock ledges. O.W. 54.
W. **denudata** A. DC. In grassland. A. & H. 1500.
W. **fasciculata** V. Brch. Occasional in grassland. J.A. 10180.
W. **grandiflora** V. Brch. Occasional in grassland. J.A. 10031.
W. **paucidentata** Schinz. In grassland. J.A. 10673.
W. **pinifolia** N. E. Br. Edge of krantz. J.A. 10219.
W. **stellaroides** Thunb. Small prostrate herb, frequent in the shade of rocks. O.W. 1740.
W. **undulata** A. DC. Frequent in moist sites in grassland. O.W. 546, 559.
W. **virgata** Engl. In grassland. J.A. 10773.
W. **zeyheri** E. & Z. Occasional in grassland. O.W. 545, 1704.
Lightfootia huttoni Sond. In grassland. J.A. 11375.
Cyphia elata Harv. Occasional in grassland. O.W. 1835.
C. **tysonii** Phillips. On rocky slopes. J.A. 10187.
Lobelia aspera Spreng. Herb on forest floor.
L. **decipiens** Sond. Occasional in grassland and locally abundant in moist sites. O.W. 544.
L. **dregeana** Sond. Colonising bare places. O.W. 95.
L. **erinus** Linn. Occasional in grassland and frequent on rock ledges. O.W. 73, 902, 1106.
L. **laxa** MacOwan. Recorded by Bews from Weenen County.
L. **natalensis** A. DC. Recorded by Bews from Upper Tugela.
L. **patula** Linn. In forest margin. J.A. 10077.
L. **preslii** A. DC. Moist sites. Hutch. 4556.
L. **stellarioides** Benth. & Hook. Vine, occasional in forest margin. O.W. 108.

COMPOSITAE.

Vernonia corymbosa Less. Shrub, frequent in Macchia. O.W. 1012.
V. **dregeana** Sch. Bip. In grassland. J.A. 11374.
V. **gerrardi** Harv. In grassland. O.W. 434.
V. **hirsuta** Sch. Bip. Occasional in grassland. O.W. 25, 625, 1367, 1585.
V. **monocephala** Harv. In grassland. J.A. 9888.
V. **natalensis** Sch. Bip. Frequent in grassland. O.W. 583.
V. **oligocephala** Sch. Bip. In marginal Thornveld. J.A. 9880.
V. **pinifolia** Less. Occasional in grassland. O.W. 665; J.A. 9857.
V. sp. (unnamed. = Wood 6861). In shade, Little Berg. O.W. 27.
Aster asper (Less.) Nees. In grassland. Hutch. 4603.
A. **asper** (Less.) Nees var. **pleiocephalus** Harv. In grassland. A. & H. 1853.
A. **bakerianus** Burtt Davy. Occasional in grassland. O.W. 359, 432, 624.
A. **filifolius** Vent. Low shrub, locally abundant in grassland. O.W. 306, 1276; Hutch. 4517.

A. muricatus Less. Occasional in grassland. O.W. 273.
A. natalensis Harv. In grassland. Hutch. 4565.
A. perfoliatus Oliv. Occasional on rock ledges. O.W. 1391; Hutch. 4564.
A. subulatus Michx. Growing in water. J.A. 11365.
A. tradescantia Linn. A weed on river banks.
A. sp. near **A. confusus** Harv. Occasional in Thornveld. O.W. 1446.
A. sp. Occasional in grassland. O.W. 1430.
A. sp. Locally abundant in mesocline grassland. O.W. 1390.
Erigeron canadense Linn. Locally abundant on old termitaria and disturbed sites in grassland. O.W. 750.
E. linifolius Willd. A tall herb which becomes very abundant in grassland protected from fire. O.W. 1849.
Felicia pinnatifida Wood & Evans. Recorded by Bews.
Nidorella anomala Steetz. Frequent in moist sites in grassland. O.W. 905.
N. auriculata DC. Locally abundant, forming dense and extensive communities in disturbed areas in vleis. O.W. 1586.
N. foliosa Cass. Occasional in grassland. J.A. 10244.
N. resedaefolia DC. Occasional in grassland. O.W. 666.
Conyza ivaefolia (Linn.) Less. var. **scabrida** (DC.) Harv. Undershrub, frequent in Thornveld bush. O.W. 1763.
C. pinnata (Linn. f.) O. Ktze. Occasional in disturbed sites in grassland. O.W. 225.
C. pinnatifida Less. Locally abundant on rock outcrops. O.W. 580.
Nolletia rarifolia Steetz. In grassland. J.A. 10672.
Chrysocoma tenuifolia Berg. Occasional in grassland up to 10,000 ft. O.W. 2133; A. & H. 1532.
Brachylaena elliptica Less. Tree, frequent in Thornveld bush. O.W. 1170.
B. ilicifolia (Lam.) Phill. & Schweick. A shrub in Thornveld. J.A. 10485.
Tarchonanthus camphoratus Linn. Tree, frequent in Thornveld, O.W. 768.
T. minor Less. Frequent in Thornveld bush. O.W. 1804.
Blumea lacera DC. Stream-bank, in Thornveld. J.A. 10720.
Laggera alata Sch. Bip. In marginal Thornveld. J.A. 10476.
Denekia capensis Thunb. Frequent in vleis. O.W. 846.
Amphidoxa gnaphaloides DC. A garden weed. J.A. 10791.
Facelis retusa Sch. Bip. Common weed in lawns and occasional in overgrazed Thornveld. J.A. 9918.
Gnaphalium luteo-album Linn. Locally abundant in moist sites and a weed of cultivation in vleis. O.W. 383, 474, 904.
G. purpureum Linn. Common weed near forest. J.A. 9964.
G. undulatum Linn. Common weed near forest. O.W. 1206.
Helichrysum acutatum DC. Mountain grassland. Hutch. 4644.
H. adenocarpum DC. Occasional in grassland. O.W. 37, 64, 752, 1041.
H. adscendens Less. Occasional in marginal Thornveld. J.A. 10237.
H. allioides Less. Frequent in grassland. O.W. 1574.
H. alticolum Bolus var. **montanum** Bolus. In grassland. Hutch. 4598.
H. appendiculatum (Linn. f.) Less. Occasional in grassland. O.W. 58, 645.
H. appendiculatum (Linn. f.) Less. var. **discolor** (DC.) Harv. Occasional in grassland. O.W. 1488.
H. aureo-nitens Sch. Bip. Locally abundant, forming dense societies in moist sites in grassland. O.W. 1572, 1508.
H. anthrixifolium O. Hoffm. Recorded by Bews from Colenso.
H. bellidiastrum Moeser. Mountain grassland. E.A.S. 484.
H. caespititium Sond. Occasional in grassland. O.W. 331, 1264; Hutch. 4641.
H. chionosphaerum DC. Occasional on rock outcrops. O.W. 1511; Hutch. 4561.
H. coriaceum Sond. In marginal grassland. Estcourt 3259.
H. cooperi Harv. In forest, in light shade. Colonises exploited and burned areas. O.W. 26.
H. epaphosum Bolus. Frequent in vlei. O.W. 1107.
H. ericaefolium Less. Frequent in marginal Thornveld. O.W. 1333.
H. ericaefolium Less. var. **albidulum** DC. In Thornveld. J.A. 9949.
H. fulgidum (Linn.) Willd. Occasional in grassland. O.W. 412.
H. glomeratum Klatt. Occasional on rock outcrops and summit grassland. O.W. 59, 1037, 1057.
H. hypoleucum Harv. Forest margin. J.A. 10433.
H. infaustum Wood & Evans. Drakensberg. E.A.S. 438; Hutch. 4643.
H. lanatum Harv. Drakensberg. Hutch. 4613.
H. latifolium (Thunb.) Less. Frequent in Alpine grassland. O.W. 457, 1700; Hutch. 4603.
H. marginatum DC. Alpine grassland. Hutch. 4578.
H. miconiaefolium DC. Locally abundant on rock outcrops. A. & H. 1641.

H. mundtii Harv. Occasional in grassland. J.A. 10205, 10210.

H. natalitium DC. Locally abundant on rock outcrops. O.W. 1044.

H. nudifolium (Linn.) Less. In grassland. J.A. 9922 ; E.A.S. 469.

H. nudifolium (Linn.) Less. var. **quinquinerve** (Thunb.) Moeser. In grassland and marginal Thornveld. J.A. 9870; O.W. 667.

H. odoratissimum (L.) Less. Occasional in grassland. O.W. 163, 812.

H. oreophilum Klatt. Abundant on overgrazed and trampled veld. O.W. 1612.

H. platypterum DC. Occasional on rock outcrops. O.W. 1043.

H. randii S. Moore. Occasional on rock outcrops. O.W. 1272.

H. retortoides N. E. Br. Alpine grassland. E.A.S. 489; Hutch. 4569.

H. rugulosum Less. Frequent in overgrazed veld. O.W. 738.

H. scapiforme Moeser. Occasional in grassland. O.W. 1270.

H. setigerum Bolus. Abundant on rocks, summit grassland. O.W. 1734.

H. setosum Harv. Occasional in grassland. J.A. 9847.

H. setosum Harv. var. **monocephalum** Wilms. Occasional in grassland. O.W. 1271.

H. simillimum DC. In Thornveld. J.A. 10801.

H. splendidum (Thunb.) Less. var. **montanum** (DC.) Harv. In Alpine grassland. A. & H. 1648; E.A.S. 541.

H. squamosum Thunb. Occasional in grassland. O.W. 62; J.A. 10068.

H. subglomeratum Less. Drakensberg. Hutch. 4587, 4593.

H. sutherlandi Harv. In mountain grassland. O.W. 1060; Hutch. 4597.

H. trilineatum DC. Alpine grassland. A. & H. 1647; Hutch. 4599.

H. trilineatum DC. var. **tomentosum** Harv. Low shrub on rocks, in Alpine grassland O.W. 1732; E.A.S. 580.

H. umbraculigerum Less. Frequent in grassland. O.W. 61, 166, 551, 1068; Hutch. 620.

H. undatum Less. var. **agrostophilum** Moes. Occasional in grassland. O.W. 585.

H. undatum Less. var. **longifolium** Moes. In Alpine grassland. A. & H. 1643.

Leontonyx coloratus Cass. Disturbed places. J.A. 10181.

Stoebe cinerea (Linn.) Thunb. A small herb, occasional in mountain grassland. A. & H. 1724.

Metalasia muricata Less. In grassland. Hutch. 4503.

Macowania glandulosa N. E. Br. Low, cushion forming shrub, frequent on rocks. O.W. 1394.

M. pulvinaris N. E. Br. Low shrub, abundant on rocks. O.W. 1729.

Athrixia angustissima DC. Occasional in grassland. O.W. 22.

A. elata Sond. Recorded by Bews from Giant's Castle.

A. fontana Macowan. Frequent in Alpine grassland. O.W. 1698; E.A.S. 581.

A. gerrardi Harv. Occasional in grassland. O.W. 63.

A. phylicoides DC. Occasional in marginal Thornveld. J.A. 10060; Hutch. 4619.

A. pinifolia N. E. Br. In mountain grassland. O.W. 1266; Hutch. 4616.

A. sp. (not matched). Occasional in grassland. O.W. 1277.

Printzia pyrifolia Less. Large shrub in forest. O.W. 202; Hutch. 4516.

Pulicaria scabra (Thunb.) Druce. River banks. J.A. 10776.

Geigeria natalensis Wood & Evans. Frequent in grassland. This is the first gathering since the type was collected near Greytown. in 1890.

Callilepis laureola DC. Occasional in grassland throughout. O.W. 599.

Acanthospermum brasilum Schrank. A roadside weed. J.A. 10052.

Ambrosia maritima Linn. A roadside weed. J.A. 10226.

Xanthium pungens Wall. A common weed.

X. spinosum Linn. A common weed. J.A. 9998.

Zinnia multiflora Linn. Weed of cultivation and frequent in overgrazed marginal Thornveld. O.W. 509.

Spilanthes acmella Linn. Along streams in Thornveld. J.A. 11224.

Bidens bipinnata Linn. Occasional in Thornveld. J.A. 11345.

B. pilosa Linn. Common weed of cultivation.

Cosmos bipinnatus Cav. Common weed of cultivation. J.A. 11388.

Galinsoga parviflora Cav. Common weed of cultivation. O.W. 1305.

Schkuhria bonariensis Hook. & Arn. Common weed of cultivation and colonises denuded Thornveld. O.W. 1750.

Tagetes minuta Linn. Common weed of cultivation.

Eumorphia sericea Wood & Evans. Frequent in Alpine grassland. O.W. 1724; Hutch. 4596.

Athanasia acerosa D. Dietr. Frequent in summit grassland. O.W. 1056; Hutch. 4505.

A. acerosa D. Dietr. var. (=Medley Wood 3969). In this variety the leaves are hairy. Locally abundant in overgrazed grassland. O.W. 1487.

A. montana Wood & Evans. Frequent in Macchia. O.W. 808; Hutch. 4509.

A. puncata Harv. Shrub, frequent in Macchia. O.W. 165, 809, 1010.

Matricaria nigellaefolia DC. A herb, in shade. J.A. 10127.
Cotula sp. Frequent on rocks in summit grassland. O.W. 1735.
Cenia hispida Benth. & Hook. Occasional in grassland. O.W. 60; Hutch. 4592.
Schistostephium crataegifolium Fenzl. Occasional in grassland. O.W. 56, 1039.
S. **griseum** Hutch. In grassland. J.A. 10643.
S. **hippiaefolium** (DC.) Hutch. Shrub, frequent in Macchia. O.W. 1009, 1066.
Artemisia afra Jacq. Shrub, frequent Macchia. O.W. 1008.
Gymnopentzia bifurcata Benth. A shrublet in grassland. J.A. 10220.
G. **pilifera** N. E. Br. Shrub, frequent in Macchia. O.W. 810.
G. sp. Shrub, common along streams, Little Berg. O.W. 789.
Pentzia cooperi Harv. Mountain slopes. Hutch. 4575.
Hertia natalensis O. Hoffm. Recorded by Bews from Mooi River.
Cineraria fruticetorum Hutch. & Taylor. Forest margin. J.A. 11486.
C. **lyrata** DC. Rocky streambed. J.A. 10705.
C. **montana** Bolus. Drakensberg. Hutch. 4537.
C. spp. Unnamed pending revision of genus. O.W. 378, 478, 749, 189.
Senecio achilleaefolius DC. Occasional in denuded areas in grassland. O.W. 274.
S. **adnatus** DC. Frequent in grassland. O.W. 565.
S. **albanensis** DC. forma. Occasional in grassland. O.W. 407.
S. **asperulus** DC. Frequent on rocks, summit grassland. O.W. 1733.
S. **barbellatus** DC. Marginal grassland. J.A. 10553.
S. **brachypodus** DC. Shrub in Thornveld bush. O.W. 761.
S. **bupleuroides** DC. Occasional to frequent in grassland. O.W. 347, 663, 816.
S. **burchellii** DC. Colonises disturbed areas. Frequent in light shade from edge of Thornveld to Little Berg. O.W. 270, 310, 788.
S. **colensoensis** O. Hoffm. Krantz in grassland. J.A. 11423; Medley Wood 3625.
S. **cordifolius** N. E. Br. Recorded by Bews from Bushman's River.
S. **decurrens** DC. Occasional in grassland. O.W. 563.
S. sp. near S. **decurrens** DC. Occasional in grassland. O.W. 1569.
S. **deltoideus** Less. Vine, frequent in forest and Thornveld bush. O.W. 771, 1169, 1848.
S. **erubescens** Ait. Occasional in moist sites. O.W. 575.
S. **erubescens** Ait. forma. Occasional in moist sites. O.W. 16, 24, 582.
S. **gramineus** Harv. Frequent on rocks, summit grassland. O.W. 1736.
S. **haplonensis** C. A. Sm. Alpine grassland. E.A.S. 510.
S. **hieracioides** DC. forma. Occasional in grassland. J.A. 10166.
S. **inacquidens** DC. In wet soil on river banks. O.W. 384.
S. **isatideoides** Phill. & Sm. A tall herb up to 6 ft. Frequent on river banks. O.W. 1015.
S. **isatideus** DC. Occasional on disturbed sites. O.W. 1566.
S. **latifolius** DC. Alpine grassland. E.A.S. 451.
S. **latifolius** DC. forma. Frequent in vlei. O.W. 906.
S. **leontodontis** DC. Occasional in grassland. J.A. 10038.
S. **macrocephalus** DC. Occasional in grassland. O.W. 1406.
S. **mikanoides** Ott. A vine, frequent in forest. O.W. 1016.
S. **orbicularis** Sond. Occasional on rock ledges. O.W. 1364.
S. **panduraefolius** Harv. Occasional in wooded kloof. O.W. 1097.
S. **paucicalyculatus** Klatt. Occasional in grassland. O.W. 436, 1567, 1568, 1571.
S. **pellucidus** DC. var. **nideralis** Harv. Common weed in moist sites. O.W. 1128.
S. **quinquelobus** DC. Vine, on krantzes. O.W. 1020.
S. **retrorsus** DC. Occasional to frequent in grassland. O.W. 1570, 1606.
S. **rhomboideus Harv.** Succulent herb, in Thornveld. J.A. 9874.
S. **rhyncholaenus** DC. On rocky koppies in grassland. J.A. 10303.
S. **serra** Sond. In grassland. Occasional in moist sites. O.W. 117, 1745.
S. **serra** Sond. var. **macrocephalus** Hutch. & B. Davy. Moist sites in grassland. O.W. 118.
S. sp. near S. serra Sond. Frequent in grassland. O.W. 1565.
S. **serratuloides** DC. Occasional in grassland, near forest. W.W. & A. 1; J.A. 10209.
S. **speciosus** Willd. Occasional in grassland. O.W. 1274.
S. **speciosus** Willd. forma. Frequent in vlei. O.W. 848.
S. **tanacetoides** Sond. In river bed, in Drakensberg.
S. **tugelensis** Wood & Evans. Recorded by Bews.
S. **tysoni** Macowan. Forest margins. J.A. 11384.
S. sp. (unnamed). In grassland. J.A. 10775.
S. sp. (= Wood 4426, unnamed). Occasional in Thornveld. J.A. 9849.
S. sp. (unnamed). Bank of stream in Thornveld. J.A. 10119.
Euryops laxus Burtt Davy. Occasional on rocky slopes. J.A. 10583.
E. **pedunculatus** N. E. Br. Small shrub in river valley. J.A. 10044.

E. setilobus N. E. Br. Dwarf shrub in grassland. J.A. 9852.
E. tysonii Phillips. A large shrub along streams. O.W. 811.
Othonna natalensis Sch. Bip. A herb, occasional in grassland and marginal Thornveld. J.A. 9841.
Garuleum sp. Wood 4385, collected in Weenen County.
Osteospermum calendulaeeum Linn. f. Frequent in overgrazed and disturbed Thornveld. O.W. 1244.
O. caulescens Harv. Occasional in grassland. O.W. 79, 172.
O. muricatum E. Mey. ex DC. A dwarf shrub in Thornveld. J.A. 9941.
Chrysanthemoides monilifera (Linn.) T. Norl. A shrub at edge of forest. O.W. 1150.
Ursinia punctata N. E. Br. Rocky places in grassland. J.A. 11469.
U. foeniculacea Poir. Recorded by Bews from Weenen County.
U. tenuiloba DC. Occasional in grassland. O.W. 328.
Haplocarpa seaposa Harv. Locally abundant on disturbed sites in grassland. O.W. 586.
Cryptostemma calendulaceum R. Br. Occasional in Thornveld. O.W. 1158.
Gazania sp. near **G. longiscapa** DC. Frequent in grassland. O.W. 272.
G. armerioides DC. Frequent in Alpine grassland. O.W. 1723; J.A. 10539.
Berkheya aristosa DC. Locally frequent on rock ledges in grassland. O.W. 1429.
B. discolor (DC.) O. Hoffm. Frequent in Macchia. O.W. 1207, 1766.
B. grandiflora Willd. Alpine grassland. E.A.S. 537.
B. mackenii Harv. Occasional in overgrazed grassland. J.A. 10168.
B. macrocephala M. Wood. Frequent in mesocline grassland. O.W. 1387.
B. onobronoides O. Hoffm. & Musc. Recorded by Bews.
B. rhapontica (DC.) Hutch. & B. Davy. Locally frequent at edge of forest. J.A. 10041.
B. setifera DC. Occasional in grassland. O.W. 581.
B. speciosa (DC.) O. Hoffm. Occasional in grassland. O.W. 652, 1388.
B. sp. Alpine grassland. E.A.S. 485.
B. sp. (not matched). Occasional in Macchia. O.W. 813.
B. sp. (= Wood 4411, 10281 from Weenen County). Unnamed. Common weed in overgrazed grassland. J.A. 10117.
Cirsium vulgare (Savi.) Airy & Shaw. A widespread weed in grassland.
Dicoma anomala Sond. Occasional in grassland and on rock outcrops. O.W. 97, 1046.
D. argyrophylla Oliv. Very abundant on overgrazed grassland. O.W. 1812.
D. macrocephala DC. Occasional in Thornveld. J.A. 9943.
Gerbera ambigua Sch. Bip. Frequent in grassland. O.W. 1312.
G. kraussii Sch. Bip. Frequent in grassland. O.W. 316, 343, 435.
G. natalensis C. H. Schultz. In grassland. J.A. 10575.
G. piloselloides Cass. Occasional in grassland. O.W. 1339.
Hypochoeris glabra Linn. Weed of cultivation. J.A. 11395.
H. radicata Linn. Occasional at edge of vlei. O.W. 453.
Tragopogon parrifolius Linn. Occasional weed in waste places. O.W. 1350.
Sonchus dregeanus DC. Occasional in grassland. O.W. 351.
S. ecklonianus DC. In grassland. O.W. 104.
S. nanus Sond. Occasional in grassland. O.W. 344.
S. oleraceus Linn. var. **ciliatus** (Lam.) Harv. Common weed of cultivation. O.W. 1310.
S. oleraceus Linn. var. **fallax** (Waltr.) Harv. Common weed of cultivation. O.W. 1311.
S. rarifolius Oliv. & Hiern. Recorded by Bews from Weenen County.
Lactuca capensis Thunb. Frequent in grassland. O.W. 352, 422.
Taraxacum officinale (Weber) Wigg. Common garden weed. J.A. 10056.
Crepis hypochaeridea (DC.) Thell. Occasional in grassland. O.W. 357.
C. polyodon Phillips. Occasional in marginal grassland. J.A. 9848.
Hieracium capense Linn. Occasional in overgrazed and disturbed grassland. J.A. 10592.
H. capense Linn. var. Recorded by Bews from Upper Tugela.

BIBLIOGRAPHY.

Adamson, R. S. (1938)...... "The Vegetation of South Africa." Brit. Empire Veg. Comm., London.

Aitken, R. D. (1922)....... "The Plant Succession in a type of midland tree veld in Natal." S.A. Journ. Sci., XVIII; 233–243.

Archibald, J. G. and Parsons, C. H. (1939) "Haying in the Rain, a study of grass silage." Bul. 362; Mass. Agric. Expt. Sta.

Arrhenius, O. (1936)....... "The Rate of Plant Migration" in "Essays in Geobotany." Univ. of California Press.

Bayer, A. W. (1933)........ "The Relationship of Vegetation to Soil Erosion in the Natal Thornveld." S.A. Journ. Sci., XXX; 280–287.

Bayer, A. W. (1938)........ "An account of the Plant Ecology of the Coast-belt and midlands of Zululand." Ann. of the Natal Mus., VIII, 3; 371–455.

Bews, J. W. (1912).......... "The Vegetation of Natal." Ann. Natal Mus., II, 3; 253–331.

Bews, J. W. (1913).......... "An Ecological Survey of the Midlands of Natal with special reference to the Pietermaritzburg district." Ann. Natal. Mus., II, 485–545.

Bews, J. W. (1917).......... "The Plant Ecology of the Drakensberg range." Ann. Natal Mus., III, 3; 511–565.

Bews, J. W. (1918).......... "The Grasses and Grasslands of South Africa." P. Davis & Sons, Pietermaritzburg.

Bews, J. W. (1921).......... "An introduction to the Flora of Natal and Zululand." City Printing Works, Pietermaritzburg.

Bews, J. W. (1921).......... "Some General Principles of Plant Distribution as Illustrated by the South African Flora." Ann. Bot., XXXV, 137; 1–36.

Bews, J. W. (1929).......... "The World's Grasses." Longman's, London.

Busse, W. (1908)............ "Die Periodischen Grasbrande in tropischen Afrika, ihr Einfluss auf die Vegetation und ihre Bedeuting fur Landeskultur." Mitt ii. d. deutsch. Schutzgeb. 21, H.2.

Bryant, A. T. (1905)....... "A Zulu—English Dictionary." The Marrianhill Mission Press, Pinetown, Natal.

Clements, F. E. (1916)...... "Plant Succession." Carnegie Inst. of Washington.

Clements, F. E. (1934)...... "The Relict Method in Dynamic Ecology." Journ. of Ecol. XXII, No. 1, 39–68.

Cook, L. (1939)............ "A Contribution to our information on Grass Burning." S.A. Journ. Sci., XXXVI; 270–282.

Du Toit, A. L. (1939)...... "Geology of South Africa." Edinburgh.

Dyer, R. A. (1937).......... "The Vegetation of the Divisions of Albany and Bathurst." Bot. Survey Mem. No. 17, Union Govt.

Eskedal, H. W. and Ostergaard, P. S. (1937) "Experience on the Feeding of Hay and Silage." Beret. Forsog. Lab. K Vet. og. Landbohojskoles (Denmark) 172; (Eng. Abs. 129–138).

Fisher, R. A. (1934)........ "Statistical Methods for Research Workers." Oliver and Boyd, Edinburgh.

Fisher, R. A. (1935)........ "The Design of Experiments." Oliver & Boyd, Edinburgh.

Fourcade, H. G. (1889)..... "Report on the Natal Forests." Natal Govt. Blue Book.

Fuller, C. (1915)........... "Observations on S.A. Termites." Ann. Natal Mus. III; 329–504.

Galpin, E. E. (1908)........ "A Contribution to the knowledge of the Flora of the Drakensberg." S.A. Journ. Sci., VI; 209–229.

Galpin, E. E. (1927)........ "Botanical Survey of the Springbok Flats." Bot. Survey Mem. No. 12, Union Govt.

Gill, E. L. (1936).......... "A First Guide to South African Birds." Maskew Miller, Cape Town.

GILLILAND, H. B. (1938)..... "The Vegetation of Rhodesian Manicaland." Journ. S.A. Bot., IV., 3; 73–99.

GLOVER, P. E. (1937)........ "A Contribution to the Ecology of the High-Veld Flora." S.A. Journ. Sci., XXXIV; 224–259.

GRIFFITH, J. J. and PHILLIPS, R. (1929) "The Warmbold System under Welsh Conditions.' Welsh Journ. Agric., V; 83.

HANSON, H. C. (1938)....... "Ecology of the Grassland." Bot. Review, IV.; 51–82.

HENKEL, J. S. (1916)........ "Forest Progress in the Drakensberg." S.A. Journ. Sci., 179–186; XIII, 5.

HENKEL, J. S. (1928)........ "The Relation of Vegetation to Water Supply in S. Rhodesia." S.A. Journ. Sci., XXV; 38–51.

HENKEL, J. S. (1934)........ "A Field Book of the Woody Plants of Natal and Zululand." Robinson & Co., Ltd., Durban.

HENKEL, J. S., BAYER, A. W. and COUTTS, J. R. H. (1938) "Sub-surface Erosion on a Natal Midlands Farm." S.A. Journ. Sci., XXXV; 236–243.

HEWITT, J. (1931)........... "A Guide to the Vertebrate Fauna of the Eastern Cape Province." Part 1, Albany Mus., Grahamstown.

HORWOOD, R. E. and WELLS, Jr. J. R. (1936) "Alfalfa molasses Silage versus Alfalfa Hay as a roughage for lactating Dairy Cows." Michigan Sta. Quarterly Bul., 19, No. 2; 100–104.

HUTCHINSON, JOHN (1946)... "A Botanist in Southern Africa." P. R. Gawthorn, London.

JACKS, C. V. and WHYTE, R. O. (1938) "Erosion and Soil Conservation." Herb. Pub. Series, Bul. No. 25, Aberystwyth.

JAEGER, F. (1911)........... "Das Hoekland der Reisenkrater." Mitt. II. d. deutsch. Schutzgeb. Erganz. 5.

KORAMO, E. (1935).......... "Weed Seeds." Gyldendal, Norsk Forlag, Oslo, 1935.

MICHAELSEN, W. (1913)...... "The Oligochaeta of Natal and Zululand." Ann. Natal. Mus. II, 4; 397–458.

MOODIE, D. C. F. (1888).... "The History of the Battles and Adventures of the British, the Boers and the Zulus, etc., in Southern Africa." Murray & St. Leger, Cape Town.

MUIR, J. (1929)............. "The Vegetation of the Riversdale Area." Bot. Survey Mem. No. 13, Union Govt.

MURRAY, S. M. and GLOVER, P. (1938) "A Preliminary Study of the Root Development of Certain South African High-Veld Grasses." Journ. S.A. Bot., I, 2; 65–70.

MURRAY, J. M. (1938)...... "An Investigation of the Interrelationships of the Vegetation, Soils and Termites." S.A. Journ. Sci., XXXV; 288–297.

OBST, C. K. (1923)......... "Das abflusslose Rumpfschollenland im Nordostlichen Deutsch-Ost-Afrika." Teil II, Mitt. d. geogr. Gesells., Hamburg, 35.

OLESEN, N. A. (1937)....... "Experiments on curing hay and ensiling." Beret. Forsog. Lab. K. Vet. og. Landbohojskoles (Denmark) 172. (Eng. abs. 129–138).

PENTZ, J. A. (1938)......... "The Value of Botanical Survey and the Mapping of Vegetation as applied to farming systems in South Africa." Bot. Survey Mem. No. 19, Union Govt.

PENTZ, J. A. (1938)......... "Soil Erosion Survey of the Reclamation Area in Natal." Sci. Bull. No. 212, Union Govt.

PHILLIPS, E. P. (1926)....... "Genera of South African Flowering Plants." Union Govt.

PHILLIPS, E. P. (1931)....... "The South African Grasses." Central News Agency, Johannesburg.

PHILLIPS, E. P. (1938)....... "The Weeds of South Africa." Bull. No. 195, Union Govt.

PHILLIPS, J. (1926).......... "*Virgilia capensis*, Lamk. A Contribution to its Ecology." S.A. Journ. Sci., 23; 435–454.

PHILLIPS, J. (1930).......... "Fire: Its Influence on Biotic Communities and Physical Factors in S. and E. Africa." S.A. Journ Sci., 27; 352–67

PHILLIPS, J. (1931).......... "Forest Succession and Ecology in the Knysna Region." Bot. Survey Mem. No. 14, Union Govt.

PHILLIPS, J. (1931).......... "The Biotic Community." Journ. Ecol., 19, No. 1; 1–24.

PHILLIPS, J. (1931).......... "A sketch of the Floral Regions of Tanganyika Territory." Trans. Roy. Soc. S.A., Vol. 19, pt. 4; 363–372.

PHILLIPS, J. (1934–35)........ "Succession, Development, the Climax and the Complex Organism: An Analysis of Concepts." In three parts, Journ. Ecol. 22, No. 2; Aug. 1934, 554–571. Idem 23, No. 1, Feb. 1935, 210–246. Idem 23, No. 2, Aug. 1935, 488–508.

PHILLIPS, J. (1935).......... "Some Problems presented by S.A. Grasses and Grass Communities." Journ. S.A. Bot., 1, pt. 2, 47–63.

ROBERTS, A. (1940).......... "The Birds of South Africa." H. F. & G. Witherby Ltd., London.

ROWLAND, J. W............. "Grazing Management." Bull. 168, Union Govt.

SAUNDERS, A. R. (1939)..... "Statistical Methods with special reference to Field Experiments." Sci. Bull. 200, 2nd ed., Union Govt.

SCOTT, J. D. (1937)......... "The Possibilities of Re-seeding Damaged Veld and Old Lands." S.A. Journ. Sci., 33, 617–624.

SCOTT, J. D., WEST, O. and PENTZ, J. A. (1938) "Progress Report, Estcourt and Tabamhlope Pasture and Reclamation Research Stations." Pasture Res. in S.A., Progress Report No. 1, 153–161, Union Govt. Pretoria.

SCOTT, J. D., WEST, O., WARD COX, R. S. H. and PENTZ, J. A. (1940) "Estcourt Pasture and Reclamation Research Station." Pasture Res. in S.A., Progress Report No. 2, 315–356, Union Govt.

SCOTT, J. D., WEST, O., BEHR, G. F. and PENTZ, J. A. (1940) "Tabamhlope Pasture and Reclamation Research Station." Pasture Res. in S.A., Progress Report No. 2, 357–370, Union Govt.

SCOTT, J. D. and PENTZ, J. A. (1938) "Watershed Protection and Reclamation Progress Report." Pasture Res. in S.A., Progress Report No. 1, 142–152, Union Govt.

STAPLEDON, R. G........... Presidential Address: Report of the Fourth International Grassland Congress, 1–6, Aberystwyth, 1937.

STAPLEDON, R. G. (1937).... "Immature Grass and Young Swards." Pts. 1 and 2. Journal Min. of Agric. 44, 317–329; 442–449.

STAPLES, R. R. (1930)....... "Studies in Veld Management." Sci. Bull. No. 91, Union Govt.

THODE, J. (1901)............ "The Botanical Regions of Natal determined by Altitude." Mercury Office, Durban.

VAN BREDA, N. G. (1939)... "An Improved Method of Sowing Grass and Karroo Shrub Seeds." S.A. Journ. Sci., 36, 328–335.

WARREN, E. (1912).......... "Specimens of Fossil Woods in the Natal Museum." II, 3, 345–380. Ann. Natal Mus.

WARREN, E. (1909).......... "Notes on the Life History of Natal Termites, based on the observations of the late Mr. G. D. Haviland." Ann. Natal Mus., II, 1; 113–128.

WEAVER, J. E. (1919)........ "The Ecological Relations of Roots." Carnegie Inst. Washington, Pub. 286.

WEAVER, J. E. and CLEMENTS, F. E. (1929) "Plant Ecology." New York.

WEAVER, J. E. and HIMMEL, W. J. (1931) "The Environment of the Prairie." Bull. 5, Conservation Dept. of the Conserv. and Survey Div., Univ. of Nebraska.

WEST, O. (1937)............ "An Investigation of the Methods of Botanical Analysis of Pasture." S.A. Journ. Sci., 33; 501–559.

WEST, O. (1938)............ "The Significance of Percentage Area Determinations yielded by the Percentage Area or Density List Method of Pasture Analysis." Journ. Ecol., 26, 1, 210–217.

WEST, O. (1938)............ "A Statistical Investigation of the Accuracy of the Method of Clipped Quadrat Productivity Sampling in use at the Rietondale Pasture Research Station, Pretoria." Pasture Res. in S.A., Progress Report No. 1, 88–96, Union Govt.

WEST, O. (1938)............ "Preliminary Report of an Investigation of the Possibilities of Commercial Exotic Clovers and Grasses on the Pasture Research Stations and on the Sources of Seed Supply." Pasture Res. in S.A., Progress Report No. 1, 87–88, Union Govt.

WEST, O. (1943)............ "The Vegetation of Weenen County, an Ecological Account of the Vegetation of the Estcourt and Weenen Districts." Thesis (unpublished) for the degree of D.Sc. in the University of the Witwatersrand, Johannesburg.

WEST, O. (1945)............ "Distribution of Mangroves in the Eastern Cape Province," S.A. Journ. Sci., XLI, 238–242.

WEST, O. (1947) (A)........ "Thorn Bush Encroachment in Relation to the Management of Veld Grazing." Rhodesian Agricultural Journ. XLIV, 5, 488–497.

WEST, O. (1947) (B)......... "Larval Parasite of *Dichapetalum cymosum*." S.A. Science, I., 3, 68–69.

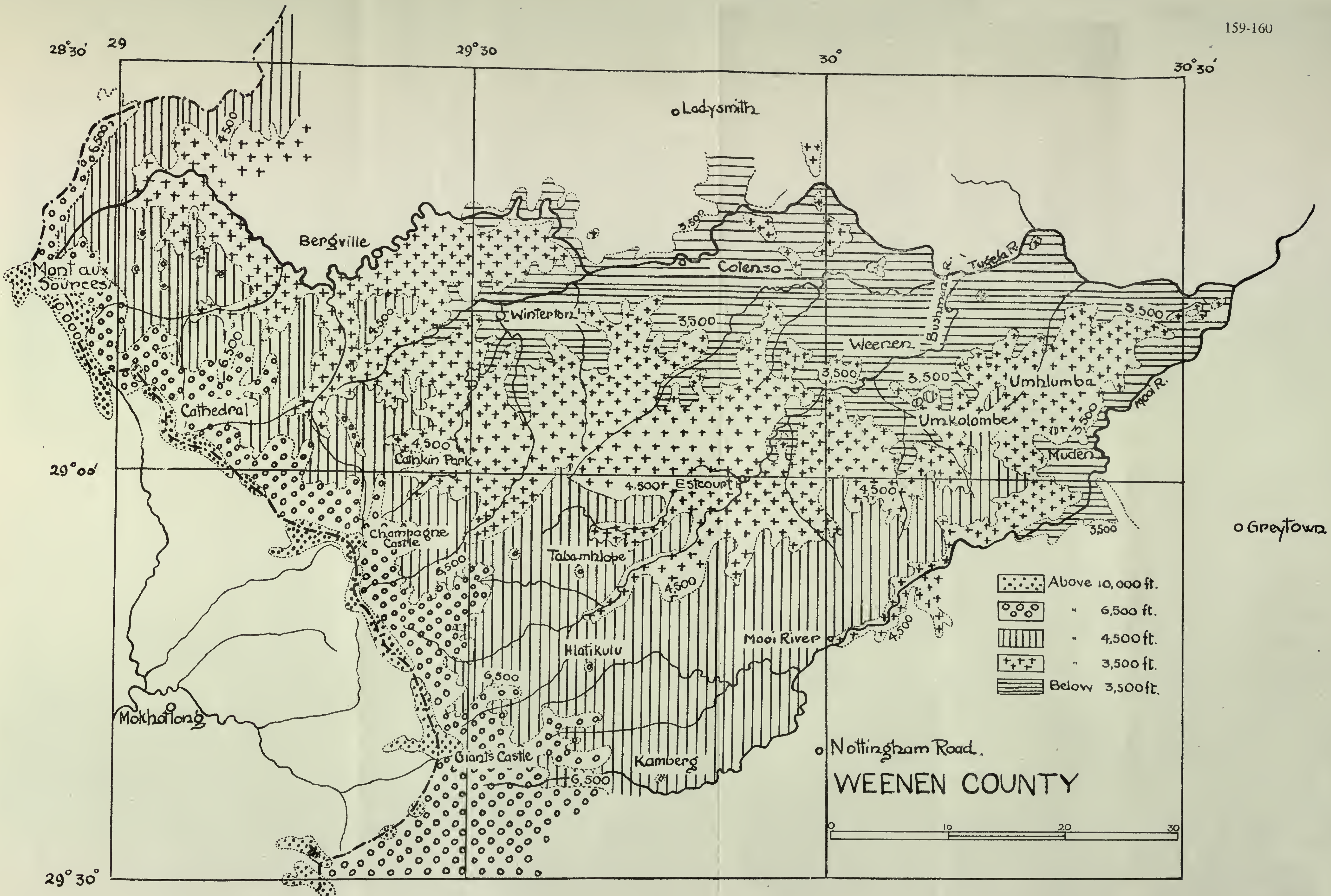
WEST, O. and RATTRAY, J. M. (1947) "Research Programme on Veld and Pasture Mangement in Southern Rhodesia." Advances in Grassland Husbandry and Fodder Production, Second Symposium, Bull. 38, Imp. Bur. of Pastures and Field Crops, Aberystwyth.

VARIOUS AUTHORS........... U.S.A. Dept. Agric. "Rules for Seed Testing." Dept. Circular 406; (1928).

Revision of "Rules for Seed Testing." Proposed by The Research Committee, Association of Official Seed Analysts of North America. (1936).

"Rules for Seed Testing." Dom. of Canada, Dept. of Agric., Seed Branch. (1937).

"Scheme of International Rules for Seed Testing." Wageningen 1931 and Stockholm 1934.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1. The Drakensberg.—Cathkin Peak and Champagne Castle from the Little Berg Plateau above Cathkin Park Hostel. The *Leucosidea sericea* consocies fills a gully in the foreground above the limit of the Evergreen Mountain Forest.

2. The Drakensberg.—A tributary of the Tugela cascading down the precipitious face of Champagne Castle formed from the basaltic lavas of the Volcanic Beds.

3. The Drakensberg.—The summit at Bushman's Pass. The Danthonia—Pentaschistis—Festuca spp. associes is evident in the foreground.

4. The Drakensberg.—The Lithosere (Xerosere) at the summit near Bushman's Pass. The shrub to the right is *Macowania pulvinaris*. The Danthonia—Pentaschistis—Festuca species associes covers the slope in the distance.

5. The Drakensberg.—Steep grass covered slopes below Cathkin Peak and Monk's Cowl. *Leucosidea sericea* and Macchia fill the valley bottom shown in the foreground.

6. The Drakensberg.—*Encephalartos ghellinckii* in the Macchia at the foot of Cathkin Peak.

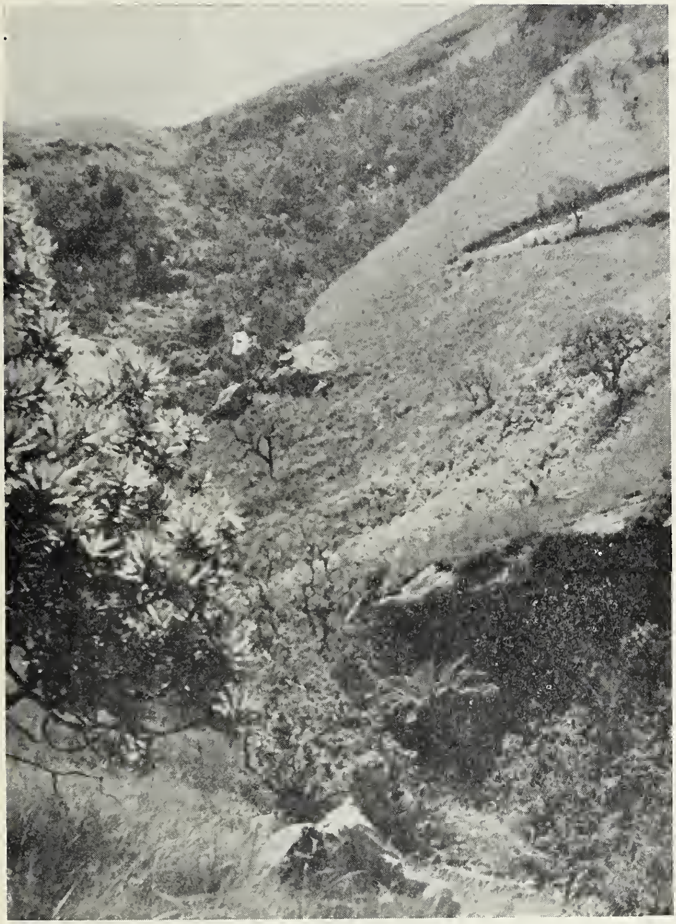
7. The Drakensberg.—Alpine grassland at Bushman's Pass. The *Bromus firmior*—other spp. associes.

8. The Drakensberg.—Stream bed below Champagne Castle. The banks are covered by *Leucosidea sericea*, which is growing here well above the limits of Evergreen Mountain Forest. The large boulders are Amygdaloidal Basalt from the Volcanic Beds.

9. The Little Berg.—Above Cathkin Park Hostel, showing crescent erosion. The underlying rock is the basalt of the Volcanic Beds. The vegetation is typical "Undisturbed Veld." *Themeda triandra* is conspicuous in the foreground.

10. The Little Berg.—A view of the valley of the Little Tugela through a pass in the Cave Sandstone capping krantz above the farm Solitude. The trees in the gorge are *Podocarpus latifolius*. A patch of *Protea caffra* Open Woodland occupies the summit to the right.

11. The Little Berg.—Under Giant's Castle, showing the Bushman's River near its source. A patch of Evergreen Mountain Forest is visible in the distance (right).



12. The Little Berg.—At the Cave Sandstone Level. *Protea roupelliae* is in the foreground (left) with *Cyathea dregei* in the stream bed. Several *Protea caffra* are growing on the steep slope to the right, while the steeply sloping valley is filled with *Leucosidea sericea.*

13. The Little Berg.—The Tree Fern, *Cyathea dregei.*

14. The Little Berg.—Undisturbed Veld on the Little Berg. The grass to the left of the path has been protected fom burning and in it *Trachypogon capensis* is flowering abundantly. To the right, in veld which was burned in Spring, no Trachypogon flowers are to be seen.

15. The Little Berg Escarpment.—In the Forest Reserve near Cathedral, showing a typical patch of Evergreen Mountain Forest. The krantz is Cave Sandstone.

16. The Little Berg Escarpment.—The Stormberg Series exposed in the Little Tugela valley on the farm Solitude in the Little Berg. The capping krantzes are Cave Sandstone. The steep slopes below the capping krantzes are formed by the Red Beds. The Molteno Beds form the bench which begins at the foot of the steep slope and is terminated by the Molteno Sandstone krantz halfway down the hillside. Note the poor development of Protea Open Woodland and Evergreen Mountain Forest. This is the north facing, xerocline slope. The opposite mesocline slope is well covered by the Protea Community and shows numerous patches of Forest.

17. The Tabamhlope Plateau.—The Hydrosere, a pool in the Little Bushman's River at the edge of the Tabamhlope Vlei.

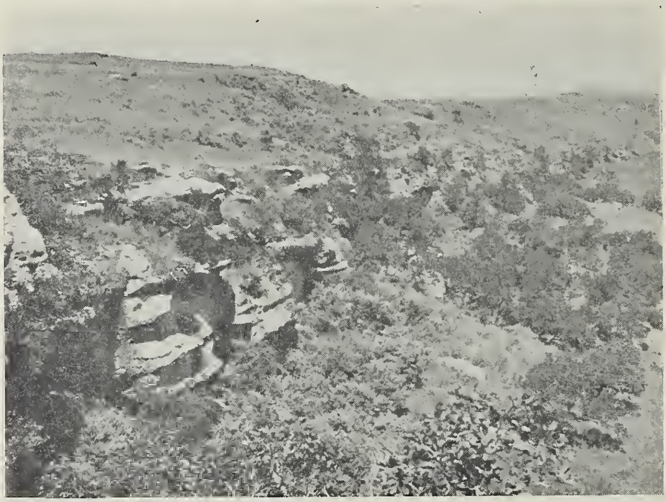
Lagarosiphon muscoides (Stage of Submerged Water Plants) can be seen darkening the surface of the water in the foreground (right) and around the shoots of *Polygonum tomentosum* to the left of the middle of the pond. The Stage of Floating Plants is absent. The Reed Swamp Stage is represented by the *Cyperus fastigiatus* consocies.

18. The Tabamhlope Plateau.—The Hydrosere, the *Phragmites communis* consocies of the Reed Swamp Stage in a pool in the Tabamhlope Vlei. *Polygonum tomentosum* can be seen growing with the reeds.

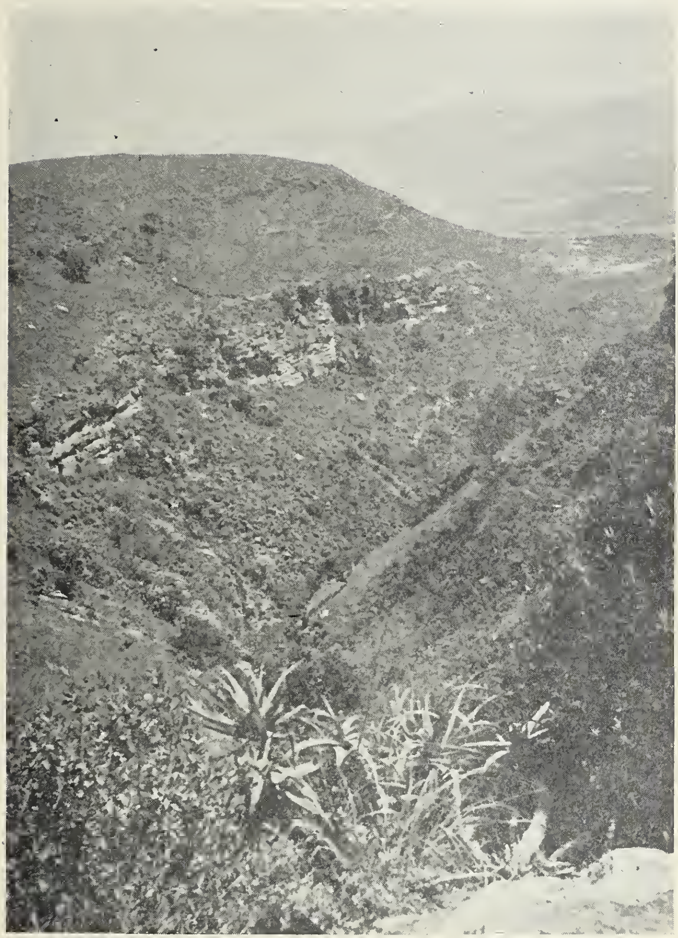
19. THE TABAMHLOPE PLATEAU.—The Hydrosere, a photograph taken in the Tabamhlope Vlei showing the *Typha capensis* consocies (left) giving way to the *Cyperus fastigiatus* consocies (right). The foreground is occupied by the *Leersia hexandra* consocies. The photograph was taken during an unusually severe period of drought when the area covered by water was considerably reduced.

20. THE TABAMHLOPE PLATEAU.—The Secondary Succession. *Eragrostis robusta* invading a *Paspalum dilatatum* pasture established on old abandoned cultivation.

21. The Tabamhlope Plateau.—A patch of Evergreen Mountain Forest on the steeply sloping Red Beds below the Cave Sandstone on Tabamhlope Mountain. Severe inroads are being made on this forest by uncontrolled grass burning.



22. The Tabamhlope Plateau.—The rim of the valley of the Little Tugela above the Tugela Location. The Sandstone krantz is formed by the uppermost horizon of the Middle Beaufort Beds and is everywhere prominent in the Draycott Escarpment. The scrub community below the krantz is seral to forest and consists of *Buddleja salvifolia*, *Leonotis* spp., *Miscanthidium capense* var. *villosum*, etc. The trees are *Greyia sutherlandii*.



23. The Tabamhlope Plateau.—A steep-sided, narrow kloof running from the plateau into the Little Tugela Valley. The Succession is apparently developing towards Evergreen Mountain Forest, but interesting variations are found in the presence of numerous species more characteristic of the Semi-deciduous Bush Association which have arrived there by migration along the river valley (Bews 1921). In the foreground are *Ficus* sp., *Aloe arborescens* and *Podocarpus falcata*. A small *Commiphora harveyi* consocies occupies the bottom of the slope in the middle distance.

24. The Draycott Escarpment.—A view of a hill projecting from the Draycott Escarpment in the Location above Melton Leigh. A striking difference in vegetation due to aspect is noted. The north-east facing slope (xerocline) to the right is covered by *Hyparrhenia hirta—Themeda triandra—Tristachya hispida* grassland characteristic of the underlying Draycott Plain, while on the south facing (mesocline) slope the conspicuous species are *Cymbopogon marginatus*, *Arundinella ecklonii* and many composites and other forbs, herbs and small shrubs.

25. The Draycott Escarpment.—View from the native owned farm near Draycott Station. Note the severe erosion caused by uncontrolled cultivation of the flat land combined with chronic overgrazing on the hillsides. The amount of soil removed by sheet erosion can be gauged by the height of the earth pillars under the large rock fragment in the foreground.

26. The Draycott Plain.—A view from the Escarpment of the donga erosion and cultivation on the native-owned farm near Draycott Station.

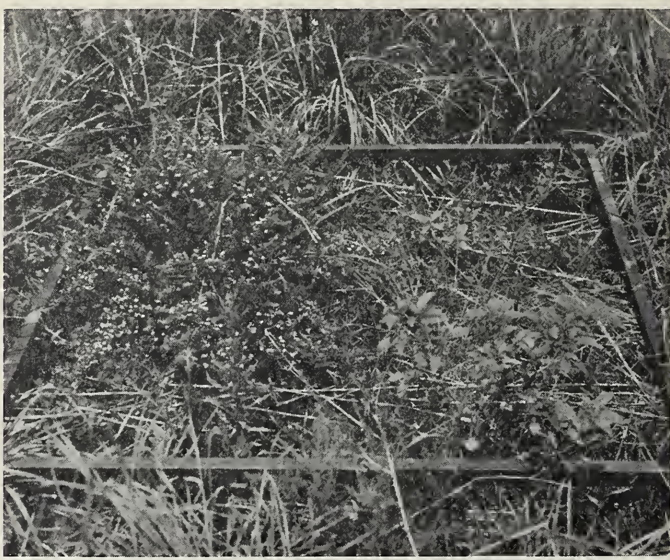
27. The Draycott Plain.—Large *Acacia woodii* trees growing in the bottoms of old donga near Draycott Station.

28. The Draycott Plain.—Earth pillars in old dongas near Draycott Station. The grass colonising the bottoms is *Hyparrhenia hirta.*

29. THE DRAYCOTT PLAIN.—Cattle resting in the shade of a fine *Acacia woodii* tree near Innersdale.

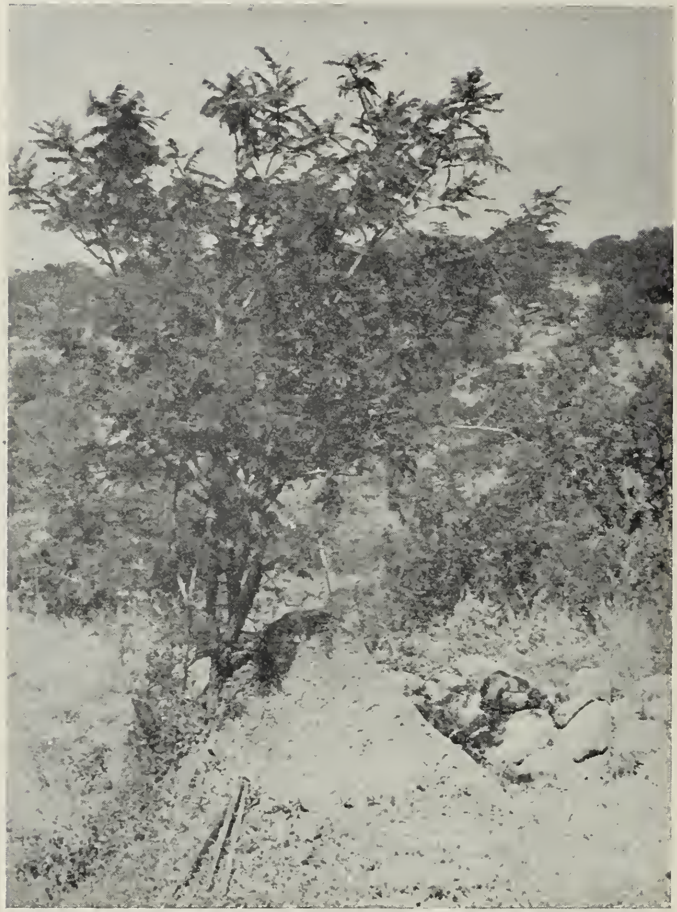
30. THE DRAYCOTT PLAIN.—The *Acacia woodii* consocies on the banks of the Little Blaauwkrantz River beyond Innersdale.

31. The Draycott Plain.—Quadrat No. 15 in Group 2 denuded by hoeing, photographed just after it had been denuded in June 1937. Note the surrounding veld, the principal species in which were *Themeda triandra*, *Hyparrhenia hirta* and *Tristachya hispida*. The tall flowering culms are *Hyparrhenia hirta*.



32. The Draycott Plain.—Quadrat No. 8 in Group 1 denuded by digging and sieving, photographed during December, 1939. A large *Walafrida densiflora* occupies the left-hand side. In front of it is a small *Erigeron unifolius*, and to the right several *Physalis angulata* plants.

33. THE DRAYCOTT PLAIN.—Quadrat No. 10 in Group 1, undisturbed, photographed during December, 1939. *Themeda triandra* in flower, is very conspicuous.

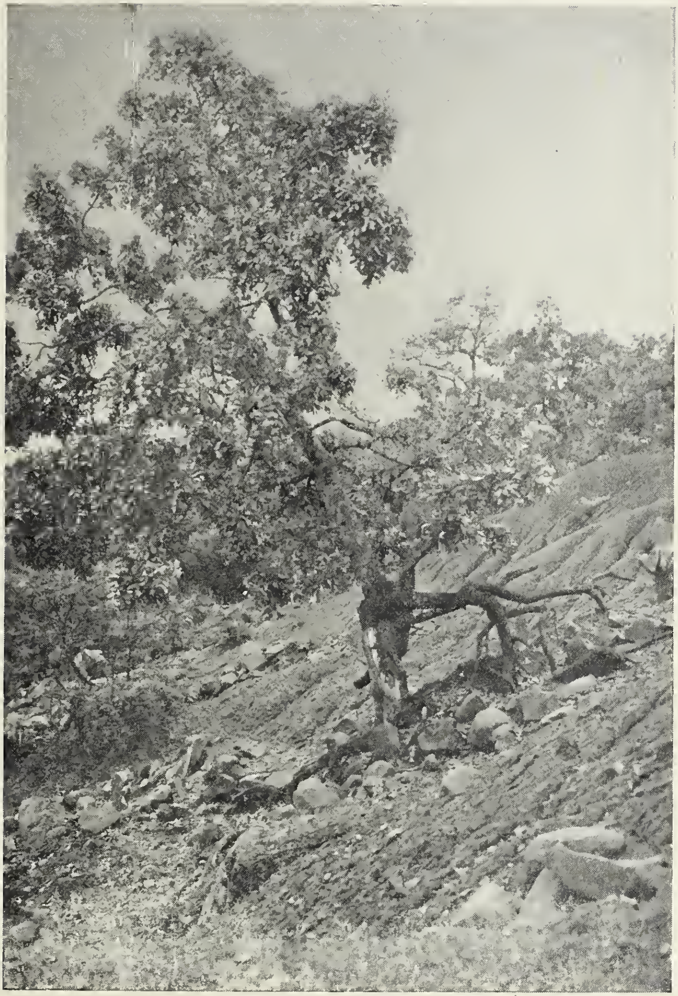


34. THE THORNVELD.—A young *Macrotermes natalensis* mound on the Estcourt Station. The mound is located under an *Acacia caffra* in the Acacia spp. associes community, which is seral to the semi-deciduous bush association. Note how closely the grass in front of the mound is cropped.

35. THE THORNVELD.—*Termes latericeus* in the Acacia species associes on the Estcourt Pasture Research Station. The opening of an air pit can be seen to the right of the camera case and three others are visible in the photograph. Note the denudation caused by this termite. Grass is almost completely absent over a considerable area around the mound.

36. THE THORNVELD.—*Acacia arabica* in the Acacia species associes with *A. karroo* and *A. caffra* on the Estcourt Pasture Research Station. This tree is growing inside one of the ancient stone kraals found throughout the area.

37. THE THORNVELD.—*Acacia litakunensis* in the Acacia species associes on the Weenen Road near Estcourt.



38. The Thornveld.—A specimen of *Schotia brachypetala* perched on its exposed roots from which the soil has been removed by erosion. Several plants of exotic *Opuntia* sp. can be seen. *Opuntia* spp. are not common in Weenen County. Photograph taken in the valley of a tributary of the Bushman's River on a farm near Estcourt.

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